IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW
OF
APPLIED MYCOLOGY

VOL. XIX MARCH 1940

TREVOR (J. S.). **The preservation of pit timber.**—*Colliery Engng*, xvi, 183, pp. 181–183, 2 figs., 1939.

The impregnation of British mine timber by creosote is commonly carried out by means of the open-tank process, but double the degree of permeation can be ensured by the use of reduced pressure, which requires, however, the installation of a more expensive plant. It was ascertained in 1935 by members of the Forest Products Research Laboratory that the average absorption of creosote by the open-tank method at the Pinxton Collieries, near Nottingham [*R.A.M.*, xv, p. 186], was 10·9 lb. per cu. ft. of props at a cost of 7·5*d.* per cu. ft. Of the 47 treated Norway pine props in use for five years, 40 were still sound, while 48 out of the 50 untreated controls were rejected. During the same period 33 out of 35 props were adequately preserved by impregnation with 2 per cent. zinc chloride at a cost of 2·1*d.* per cu. ft. Excellent results have also been obtained with Wolman salts [ibid., xvii, p. 2] (48 out of 49 props sound), treatment with which costs only 3½*d.* per cu. ft. at a strength of 2 per cent.

A promising new solvent preservative is copper naphthenate [ibid., xvi, p. 430], used as a 15 per cent. white spirit solution. It is a greenish, hard, resinous, sharp-smelling product formed by mixing copper sulphate with sodium naphthenate. Being entirely insoluble in water, it is particularly suitable for all timber liable to be placed in damp or waterlogged situations. When immersed in water for any length of time the copper naphthenate in the wood hydrolyses slowly, forming copper hydroxide and free naphthenic acid, both actively toxic to wood-destroying fungi. Other advantages of this compound, which is also effective in the preservation of the sisal fibres constituting the core of wire ropes, are its cleanliness and non-inflammability.

Other potentially interesting possibilities for future development, too expensive for present use, are briefly outlined. One is the partial impregnation of the wood with synthetic resins, followed by polymerization with a weak solution of mineral acid, while another, described in a recent patent, B.P.487,041, consists in double impregnation, first by alkali hydrate and then, after drying, with carbon disulphide to produce an impure viscose which forms an impermeable, fully protective coating. There is also the chlorinated diphenyl, known commercially as aroclors, which like the six other related compounds is waterproof, readily soluble in common organic solvents, resistant to inorganic acids and alkalis, as

well as to vaporization, and possesses other valuable properties conducive to absolute protection.

SMIETON (MARGARET J.). **On the use of chlorinated nitrobenzenes for the control of club root disease of Brassicae.**—*J. Pomol.*, xvii, 3, pp. 195–217, 1939.

In experiments on the control of club root of different species of *Brassica* (*Plasmodiophora brassicae*) [*R.A.M.*, xviii, p. 508] carried out over a period of four years at Slough, Bucks, commercial preparations of pentachlornitrobenzene and trichlornitrobenzene (referred to throughout this paper as substances A and B but obtainable under the trade names, folosan and brassisan [ibid., xvii, p. 471], respectively) were tested in comparison with mercuric chloride. The results obtained with white mustard grown on artificially contaminated soil in seed-boxes showed that the average percentages of clubbed seedlings in untreated soil and in that treated with A, B (each applied at the rate of 18 oz. per cu. yd. with lime as a filler), or mercuric chloride (0·1 per cent. solution, 2 gals. per sq. yd.) were 70, 38, 0, and 2, respectively. The results of four further experiments conducted on similar lines again demonstrated that B was superior to A, and that it equalled mercuric chloride in two out of three tests. The phytocidal effect of B was less marked when chalk was used as a filler, but better control of the disease resulted from the use of lime with both A and B.

The results obtained in outdoor seed-bed trials were rather irregular, but substance B, applied at the rate of 1½ to 3 oz. per sq. yd., gave a varying and sometimes considerable degree of control, though the larger dose tended to reduce the stand of seedlings.

Applied at the time of transplanting to dibble holes, small quantities of either A or B diluted with soil gave good control with increases in crop weight. When the standard method of dibble-hole treatment (one level dessert spoonful of a 1 : 5 volume mixture of fungicide and soil) was used in plots of Shaw's Nonpareil cabbage, substance B (lime filler) reduced infection from 20 very severely and 1 medium clubbed plants in the untreated to 0 and 21, respectively, the average weight of untreated and treated plants being 0·9 and 6·8 oz., respectively, while the corresponding figures in another test were 26 and 4, 0 and 3, and 4·5 and 7·3, respectively. In all outdoor trials mercuric chloride was again slightly more effective than the other two fungicides, but all three tended, in a variable degree, to check the growth of plants. Substance A is fungicidally inferior to B but is the least phytocidal of the three agents tested; in mild attacks it has given very good results.

PÁZLER (J.). **The spraying of Sugar Beets as a protection against Cercospora beticola Sacc.**—*Listy cukr.*, lvii, pp. 372–374, 1939. [Czech. Abs. in *Chem. Abstr.*, xxxiii, 22, p. 9525, 1939.]

During 1934, 1935, and 1938 a 1 per cent. cuprispora solution (consisting mainly of a copper soap) [*R.A.M.*, xviii, p. 721] was as effective as 1 per cent. Bordeaux mixture in the control of *Cercospora beticola* on sugar beets in Czechoslovakia [ibid., xv, p. 373]. In one experimental area in 1938 the green and root weights of treated beets were 333·9

and 458 quint. per hect., respectively, and the sugar yield and concentration 86·2 quint. and 18·83 per cent., respectively, the corresponding figures for the unsprayed controls being 168·6, 382·8, 62·3, and 16·27 per cent., respectively. Comparable results were obtained in other parts of the country. Late (August and September) treatments were still effective and beneficial. Importance is attached to the effect of the spray on the injurious amino nitrogen content of the plants, beets sprayed with cuprispora, 1 per cent. Bordeaux mixture, and untreated yielding 0·041, 0·042, and 0·055 per cent. amino nitrogen, respectively.

Scott (G. T.). **Progress in growing Sugar Beet seed.**—*Proc. Amer. Soc. Sug. Beet Technol., 1938*, 1939. [Abs. in *Facts ab. Sug.*, xxxiv, 11, pp. 39–40, 1939.]

Six sugar beet varieties that have figured in the West Coast (California) Beet Seed Committee's planting operations during the past three years are characterized as follows in relation to curly top resistance [*R.A.M.*, xviii, p. 777]: U.S. No. 12 high, U.S. Nos. 14 and 15 moderate, Nos. 33 and 34 fair, and A-600 high. No. 14 is susceptible and 15 resistant to mildew [*Peronospora schachtii*: ibid., xviii, p. 150]. All the best varieties are fair to good yielders.

Leach (L. D.). **Effect of downy mildew on Sugar Beets.**—*Proc. Amer. Soc. Sug. Beet Technol., 1938*, 1939. [Abs. in *Facts ab. Sug.*, xxxiv, 11, p. 40, 1939.]

Experiments in California in 1937 and 1938 showed that downy mildew [*Peronospora schachtii*: *R.A.M.*, xvii, p. 720 and preceding abstract] interferes with the normal production of sugar beets by reducing the average root weight, sucrose percentage, and purity, all these effects being more serious in the case of early than in that of late infections. In one of the two localities under observation the Hartmann and Eagle Hill appeared to be the most resistant and U.S. No. 14 the most susceptible [loc. cit.], while in the other R[abbethge] and G[iesecke] AA was the most resistant, followed by Hartmann, with U.S. No. 14 again the most susceptible.

Leach (L. D.). **Results of Beet seed treatment, 1938.**—*Proc. Amer. Soc. Sug. Beet Technol., 1938*, 1939. [Abs. in *Facts ab. Sug.*, xxxiv, 11, p. 39, 1939.]

Effective control of damping-off of sugar beets (*Pythium ultimum* [*R.A.M.*, xiv, p. 671], *Corticium solani* [ibid., xix, p. 1,] and other fungi) was found by experimental observations in 1938 in the Pacific Coast region of the United States to be practicable by means of seed treatment with ceresan [ibid., xvii, p. 153] at the rate of 1 to 1½ lb. per 100 lb., the improvement in the final condition of the stands being particularly noticeable in sparsely sown plantings. Definite symptoms of mercury injury were detected on the seedlings in one of the treated strips, and it was found that the presence of moisture and close confinement of the treated seed are the two most important factors in reducing the safety of the mercury treatment. Pending further observations on the operation of these factors in the warehouse, it is recommended that beet seed

should not be treated until a few days before planting, great care being taken to exclude moisture both before and after disinfection.

CAMPBELL (L.). **Black root of Sugar Beets in the Puget Sound section of Washington.**—*Bull. Wash. St. agric. Exp. Sta.* 379, pp. 5–14, 2 figs., 1939.

In this expanded, tabulated account of the writer's studies on the etiology and control of black root of sugar beets in the Puget Sound district of Washington [*R.A.M.*, xviii, p. 441] it is stated that *Rhizoctonia* [*Corticium*] *solani*, *Pythium de Baryanum*, *Aphanomyces cochlioides*, and *Fusarium* sp. associated with the disease are only saprophytic invaders, the true pathogen being *Phoma betae*. The bowing of the petioles described by Nuckols and Tompkins [ibid., viii, p. 542] is characteristic of the disease, the symptoms of which are given in detail. In control experiments none of the treatments tested was successful where the soil was heavily infected, but evidence was obtained that the use of 2 per cent. ceresan or new improved ceresan should be valuable against the pre-emergence stage where the incidence of black root lies between 25 and 50 per cent. Until a method of controlling the post-emergence stage of the disease is developed crop rotation combined with seed disinfection are recommended. Local seed has not been found to carry the fungus and its use is advocated.

BERTRAND (G.). **Sur la maladie du cœur de la Betterave et son traitement par le bore.** [On the heart rot of Beetroot and its treatment by boron.]—*Sucr. belge*, lix, 1, pp. 3–8; 2, pp. 21–30, 1939.

This is a useful survey and critical discussion of some outstanding contributions to the understanding and control of heart rot of beet, the first authentic reference to which would appear to date from 1864 in France [*R.A.M.*, xvii, p. 643]. Much of the recent work on the treatment of the disease by means of soil amelioration with boron has been noticed from time to time in this *Review*. [This paper also appears in *Ann. agron.*, N.S., ix, 4–5, pp. 548–567, 1939.]

PRICE (W. C.). **Cross protection tests with two strains of Cucumber mosaic virus.**—*Phytopathology*, xxix, 10, pp. 903–905, 1 fig., 1939.

In order to ascertain whether the cucumber mosaic virus of Doolittle (*Phytopathology*, vi, pp. 145–147, 1916) and Porter's 'white pickle' virus [*R.A.M.*, xi, p. 349] should be classified in different groups, the former was inoculated at the Rockefeller Institute for Medical Research, Princeton, New Jersey, into young Golden Gem *Zinnia* [*elegans*] plants, in which it induced systemic mottling and marginal necrosis of some of the leaves. When the disease was thoroughly established, four to six leaves on each plant were rubbed with strain 6 of Porter's virus [ibid., xiv, p. 5], which was also inoculated into an equal number of healthy zinnias. In one of the tests 413 necrotic lesions developed in eight days on 22 previously sound leaves and one on the same number of mottled ones, the corresponding figures for another trial involving 56 leaves being 1,324 and none, respectively. This protective action of Doolittle's virus against strain 6 is considered to show its close relationship to Porter's 'white pickle', which exerts a similar

immunizing effect against strain 6. These two viruses,therefore, despite symptomatological and serological differences, should be placed in the same virus group [cucumber virus 1].

LEFEBVRE (C. L.) & WEIMER (J. L.). **Choanephora cucurbitarum attacking Cowpeas.**—*Phytopathology*, xxix, 10, pp. 898–901, 2 figs., 1939.

In 1937 and 1938 cowpeas at the Georgia Agricultural Experiment Station were attacked by *Choanephora cucurbitarum* [*R.A.M.*, xv, p. 632], the affected varieties being Groit (5 per cent. in the former year), Brown Sugar Crowder (one of the most susceptible), Etheridge, Crop Crowder, Jumbo Blackeye, Conch, Virginia Blackeye, Red Hulled Speckled, and California Blackeye. The fungus was most active on ripe or semi-mature densely shaded pods in damp, foggy weather, and was also commonly present on fallen flowers. In inoculation tests maturity was also a pre-requisite condition for a successful outcome, and the organism is therefore considered to be a weak parasite of cowpeas. Positive results were given by inoculations with *C. cucurbitarum* from cowpeas on Cymling and Summer, but not on Acorn squashes. Attention is called to the presence, not previously reported, of very fine longitudinal striations on the spore walls. The fungus also commonly occurs as a saprophyte on the leaves of grasses in Georgia and Florida.

MACDONALD (J. A.). **Plant diseases of St. Andrews district.**—*Trans. bot. Soc. Edinb.*, xxxii, 4, pp. 556–559, 1939.

In this annotated list of plant diseases found in the vicinity of St. Andrews during the past four years the author states that uredospores and teleutospores of *Puccinia pruni-spinosae* [*R.A.M.*, xviii, pp. 375, 745] were observed to be abundantly present on cultivated plum trees. This would seem to be the first Scottish record of these stages. *Coleosporium campanulae* [ibid., xvii, p. 797] was noted on cultivated *Campanula glomerata* and *C. persicifolia*. Arum lilies [*Zantedeschia aethiopica*] in three houses were attacked by *Phyllosticta richardiae* [ibid., xvi, p. 86], the yield of blooms in one house being reduced to one-fifth of the normal figure. Dark, waterlogged areas appeared on the petioles and leaves, and in severe cases all the leaf stalks were diseased. Young *Richardia* [*Zantedeschia*] plants were experimentally infected by atomizing them with a spore suspension of the fungus and retrocultures were successfully obtained.

Although always grown in the same house as chrysanthemums that became infected with powdery mildew (*Oidium* sp.) [*O. chrysanthemi*: ibid., xvii, p. 460], cinerarias [*Senecio cruentus*] showed no sign of such disease until late in 1938 [ibid., xviii, p. 459]; spore measurements indicated that the *Oidium* on chrysanthemum belonged to a different species from that found on cineraria.

MARCHAL (E.). **Observations et recherches effectuées à la Station de Phytopathologie de l'État pendant l'année 1938.** [Observations and researches carried out at the State Phytopathological Station during the year 1938.]—*Bull. Inst. agron. Gembloux*, viii, 2, pp. 77–85, 1939. [Flemish, German, and English summaries.]

This report [cf. *R.A.M.*, xvii, p. 654] contains, among others, the

following items of phytopathological interest. Wheat in Belgium was commonly affected by eyespot lodging due to *Cercosporella herpotrichoides* [ibid., xviii, p. 448], but infection occurred only where unsatisfactory methods of cultivation had been practised. Pear branches were attacked, probably as a result of frost injury, by *Dermatea* [*Myxosporium*] *corticola* [ibid., xvii, p. 586], other pears being also infected by *Gymnosporangium sabinae* [ibid., xviii, p. 413] and *Mycosphaerella sentina* [ibid., xvi, p. 191, xviii, p. 820]. Raspberries were attacked by *Didymella applanata*, a fungus not recorded hitherto from Belgium. *Bacterium* [*Pseudomonas*] *syringae* [ibid., xviii, p. 154] occurred on lilac, and wilt of *Clematis* sp. was caused by *Verticillium albo-atrum*. A species of *Dracaena* was very severely infected by *Phyllosticta dracaenae*, and *Colletotrichum omnivorum* was on several occasions observed on *Aspidistra*.

Padwick (G. W.). **India and Burma : new plant diseases recorded in 1938.**—*Int. Bull. Pl. Prot.*, xiii, 11, pp. 256–258, 1939.

This list of plant diseases newly recorded in India and Burma during 1938 includes, in addition to items already noticed from other sources, *Fomes melanoporus* causing laminated heartwood rot of *Shorea robusta* and *F. lamaensis* causing honeycombed rot of sapwood and heartwood of the same host, both in the United Provinces.

Dey (P. K.). **Plant pathology.**—*Rep. Dep. Agric. Agra Oudh, 1937–8*, pp. 55–58, 1939.

Among the items in this report may be mentioned the Government sanction for the expenditure of a sum of Rs. 14,450 [£1,053. 15*s*.] for the importation from Scotland of 1,000 maunds [1 maund = 82·284 lb.] of Dunbar Cavalier and Majestic potato seed to be multiplied in the hills and eventually supplied to the plains of the United Provinces with a view to arresting deterioration from virus diseases.

A satisfactory new paste for the treatment of pruned surfaces on apple trees consists of red lead, copper carbonate, and linseed oil.

Report of the Agricultural Department, Dominica, 1938.—25 pp., Imp. Coll. Trop. Agric., Trinidad, 1939.

The following items of phytopathological interest occur in this report. Panama disease of bananas (*Fusarium* [*oxysporum*] *cubense*) [*R.A.M.*, xvii, p. 730] was found in 1·61 per cent. of the 37,165 stools inspected during the year. Banana leaf spot (*Cercospora musae*) [loc. cit.] is spreading on the one plantation where it was found in February, 1938, in spite of all attempts at control. Withertip of limes (*Gloeosporium limetticolum*) [ibid., xviii, p. 672] was exceptionally severe during the wet season, but the crop is now almost entirely produced by budded trees and the exports increased from the equivalent of 36,422 barrels in the previous year to 58,982 barrels.

Reichert (I.). **Palestine : diseases of vegetable crops.**—*Int. Bull. Pl. Prot.*, xiii, 10, pp. 225–240, 1939.

This is a list, in the compilation of which the author was assisted by M. Chorin, G. Minz, J. Perlberger, and F. Littauer, of the fungal,

bacterial, non-parasitic, and undetermined diseases of Palestine vegetable crops. New records, if any, are not specified.

McCormack (R. B.). **Secção de Fitopatologia.** [Section of Phytopathology.] *ex* **O Instituto de Pesquizas Agronomicos de Pernambuco.** [The Institute of Agricultural Research of Pernambuco.]—*Rodriguésia*, iv, 12, pp. 30–34, 1939.

Among the phytopathological problems occupying the attention of members of the Pernambuco (Brazil) Institute of Agricultural Research (stated in a foreword by A. B. Fagundes to have been founded on 7th September, 1935) are the following. Heavy losses are caused by boll rots of cotton, associated with species of *Aspergillus*, *Penicillium*, *Nematospora*, a pink *Fusarium*, yeasts, and in some cases with bacteria entering through the perforations made by insects, chiefly *Platyedra gossypiella*. Injuries of this type are specially prevalent under humid conditions. Most boll rots are initiated by insect infestation, an exception being that due to *Rhizopus nigricans*. Leaf rust (*Cerotelium desmium*) [*R.A.M.*, xviii, p. 575] occurs in a destructive form in parts of the State, inducing premature defoliation and thereby lowering the output of the crop. Areolate mildew (*Ramularia areola*) [*Cercosporella gossypii*: loc. cit.] is widespread but unimportant. Red leaf, a physiological disturbance [ibid., xvi, p. 97], is troublesome on soils deficient in potash. Young stands are liable to decimation by sore shin or damping-off (*Corticium vagum*) [*C. solani*], while a *Rhizoctonia* is responsible for a root rot of cotton and beans [*Phaseolus vulgaris*]. *F. vasinfectum* [f. 1] was isolated from two wilted plants in an experimental plot in November, 1936 [ibid., xvii, p. 35], since when the disease has spread to a considerable extent. Although the percentage of transmission by means of the seed is low (2 to 4), this channel is of great importance in the introduction of infection into hitherto healthy sites. Preliminary experiments in the sterilization of the seed with sulphuric acid have given promising results.

In some parts of the Recife district the tomato crops have been completely destroyed by *Bacterium solanacearum*, while blossom-end rot was severe in Dois Irmãos during the period under review [ibid., xviii, p. 637].

Other diseases under investigation include bean anthracnose (*Colletotrichum lindemuthianum*) [ibid., xiv, p. 734], *C. gloeosporioides* on mango [ibid., xvii, p. 539] and avocado [ibid., xvii, p. 612], and the algal rot (*Cephaleuros mycoidea*) of the foliage of mango, avocado, bread fruit [*Artocarpus integrifolia*], citrus [ibid., xvii, p. 596], and other fruit trees.

Ehrke (G.). **Fortlaufend arbeitender Kurznassbeizapparat mit Umlaufwaage der Fa. Gebr. Röber G.m.b.H., Wutha (Thür.) (Einzelprüfung).** [A continuously working short liquid disinfection apparatus with a rotatory balance from the firm of Röber Bros., Ltd., Wutha (Thuringia). (First trial).]—*Masch. u. Geräteprüf. Reichsnährst.* (Suppl. to *Tech. in d. Landw.*), iv, 5, pp. 35–36, 1 fig., 1939.

Particulars are given of the construction and use of the Röber short

liquid steeping apparatus, which, like the dusting machine supplied by the same firm [*R.A.M.*, xviii, p. 604], is fitted with a special contrivance for regulating the automatic distribution of the fungicide. The equipment treats 800 kg. of seed-grain per hour and the average values for utilization of the fungicide in four lots of rye and oats were 96·65 and 95·5 per cent., respectively.

Ehrke (G.). **Selbsttätig arbeitender kombinierter Kurznass- und Trockenbeizer 'Poppelsdorf' Bauart Dipl.-Ing. Ott, der Maschinenfabrik F. Neuhaus G.m.b.H., Eberswalde. (Einzelprüfung).** [An automatically working combined short liquid and dry disinfection apparatus of Dipl.-Ing. Ott's construction, from the machine factory of F. Neuhaus, Ltd., Eberswalde. (First trial).]—*Masch. u. Geräteprüf. Reichsnährst.* (Suppl. to *Tech. in d. Landw.*), iv, 10, pp. 75–76, 1 fig., 1939.

In collaboration with S. Reeh, K. Ebertz, and A. Winkelmann, the writer tested the 'Poppelsdorf' combined short liquid and dry seed-grain-disinfecting equipment, representing a constructional development and improvement in comparison with the original apparatus, 'Neusaat-Automatic', applicable with the former method only [*R.A.M.*, xviii, p. 466]. Applying the dust at rates of 200, 300, and 400 gm. per 100 kg., respectively, to rye and two lots of oats, the values obtained were 93·1, 95·4, and 96·3 per cent., respectively, of the possible maximum.

Riehm (E.). **Establishment of an international collection of cereal varieties for the study of the physiological races of rusts.**—*Int. Bull. Pl. Prot.*, xiii, 11, pp. 259–261, 1939.

The author points out that plant breeders require to know the reaction of cereal varieties to rusts (*Puccinia* spp.) not only in their own countries but also in neighbouring ones, where different physiologic races of the rusts may exist. Such information may safely be obtained only by field experiments in the countries concerned and proposals are put forward for international collaboration in such a project.

Parker-Rhodes (A. F. T.). **Humoral immunity among plants.**—*Nature, Lond.*, cxliv, 3656, pp. 907–908, 4 graphs, 1939.

Leaves of wheat seedlings were inoculated with *Puccinia graminis tritici* and *P. rubigo-vera triticina* [*P. triticina*] and two or three days later severed from the plant, the rust being destroyed by placing the leaves in a water bath at 40° C. for 15 minutes. They were then inoculated again with the same or the other fungus, and the course of decay (comprising flecking, chlorosis, sporulation, withering, and the like) was recorded (according to an arbitrary scale) for up to ten days. The results are graphed and compared with calculated curves obtained by adding the data from two single inoculation controls. It was found that whereas the curves for the leaves inoculated with and cured of one rust and reinoculated with the other were almost identical in form and magnitude with those calculated for the controls, the curves for the leaves reinoculated with the same rust were retarded and enhanced as compared with the calculated curves, and did not bend sigmoidally,

as did the others, within eight days of the treatment. This would appear to indicate that while no appreciable interaction occurred between the two inoculations with different fungi, the two like inoculations did so interact. As the rust of the first inoculation was in every instance destroyed, the interaction was probably due to the production of some specific humour by the rust inoculated first.

WALDRON (L. R.) & HARRIS (R. H.). **New varieties of rust resistant Wheat.**—*Bi-m. Bull. N. Dak. agric. Exp. Sta.*, i, 3, pp. 35–37, 1939; *Northw. Miller*, cxcviii, 7, p. 4, 1939. [Abs. in *Plant Breed. Abstr.*, x, 1, pp. 26–27, 1940.]

Of the four new wheat varieties described, namely, Rival, Vesta, Mercury, and Pilot, the three first-named were developed in North Dakota from a cross of Ceres × (Hope × Florence) and the last bred by J. A. Clark from a Hope × Ceres cross. Rival and Pilot were ready for general release in 1939, while the other two required further testing. Rival is slightly more susceptible to stem rust [*Puccinia graminis*] and less so to leaf [brown] rust [*P. triticina*] than Thatcher [*R.A.M.*, xix, p. 10].

NAOUMOFF (N. A.). Ржавчина хлебных злаков в СССР. [Rusts of cereals in the U.S.S.R.].—403 pp., 38 figs., 8 diags., 16 graphs, Moscow-Leningrad, Selkhozgiz, 1939. Roub. 18·50.

This monograph of cereal rusts is based on both Russian and foreign studies and represents a world survey of the present state of knowledge on the problem. The book, to which a bibliography of almost 2,000 titles is added, deals exhaustively with the cyclic development of rusts, the losses caused by them and methods of assessment, the influence of environmental conditions on rust incidence, physiologic races, varietal resistance and plant breeding, means of control, and methods of rust research in the field and the laboratory.

Rust of cereal crops.—286 pp., 7 figs., 5 graphs, 13 maps. Госуд. Издат. колх-совх. Литер. „Сельхозгиз" [State Publ. Off. Lit. collect. co-op. Farming 'Selkhozgiz'], Moscow, 1938. [Received December, 1939.] Roub. 11.

This is a collection of papers on subjects dealt with at the First Pan-Soviet Conference on the Control of Cereal Rusts, held in 1937.

K. E. MOURASHKINSKY (pp. 94–101) summarizes the results of investigations on the cereal rust situation in West Siberia, carried out by various workers since 1925, as follows. On wheat *Puccinia triticina* and *P. graminis* were ubiquitous, the former being the more severe, while *P. glumarum* was considerably less frequent; on rye *P. dispersa* [*P. secalina*] and *P. graminis* were widespread, the former usually being the more virulent, while *P. glumarum* occurred rarely; on barley the most destructive rust was *P. graminis*, but *P. simplex* [*P. anomala*] and *P. triticina* were both present, the former being very common, while *P. glumarum* was ubiquitous on this host, but did not cause heavy losses; the species *P. hordeina* [*R.A.M.*, xii, p. 307] is believed to be identical with *P. triticina*; on oats *P. coronifera* [*P. coronata*] and *P. graminis* were almost equally serious. The alternate hosts, with the

exception of *Rhamnus cathartica*, are stated to play only a small part under West Siberian conditions, the chief sources of infection of spring cereals being the winter-sown wheat and rye, and possibly the uredospores overwintering on self-sown plants.

V. A. Zolotnitzky (pp. 149–159) states that black and brown rusts [*P. graminis* and *P. triticina*] are responsible for considerable losses of wheat in the Amur region [Far East], where the wheat varieties grown at present are said to be fairly resistant to rusts, but poor yielders, while most of the introduced ones prove susceptible under the particularly humid conditions which prevail. Several promising hybrids have, however, been obtained from crosses between the resistant and the productive varieties.

G. S. Galleeff (pp. 160–162) found that the yield of oats in the Voronezh district was reduced in 1933 from between 550 to 1,000 kg. per hect. to 400 by the attacks of rust [*P. coronata*]. In breeding experiments conducted from 1925 to 1936 the promising hybrids 17/30 and 15/37 were selected from among the 300 lines propagated from the F_3 generation of the cross between Red Rustproof 2869 and White Tartar 2174, and proved to be immune from *P. coronata*.

Mme T. I. Fedotova (pp. 163–169) applied the serological method to the determination of varietal resistance of wheat to physiologic races of *P. triticina*. The data showed that the globulins of different varieties do not react identically with serum prepared against the same race, and the globulins of one variety react differently with sera prepared against different races, indicating a varying degree of susceptibility of wheat varieties to different races of the rust. A comparison of the results obtained by the serological method with those from experimental infection of seedlings or field trials showed almost complete agreement in 16 out of 18 wheat varieties.

A. S. Barmenkoff (pp. 180–197) states that physiologic races 20 and 65 of *P. triticina* of different ecological and geographical origin proved to be heterogenous and points out that they are not accurately distinguished by the eight standard differential varieties of wheat. The author proposes the following additional varieties: Apulicum 77/2, Moskovskaya 02453, Melanopus 037, and Gordeiforme 010 for the differentiation of race 20 and Apulicum 77/2, Erythrospermum 020/430, Kanred × Fulcaster 266321, Argentine H31, and Fulcaster for that of race 65.

Mme M. N. Egorova (pp. 198–203) determined the presence of races 65, 20, 9, 17, and 66 of *P. triticina* in 54 collections made in the districts of Krasnodar and Ordzhonikidze [south-eastern Russia] from different varieties of wheat. The races occurred in the above-mentioned order of frequency. Evidence was obtained that race 65 is not homogeneous under different ecological conditions.

K. T. Sukhorukoff (pp. 204–209) discusses the physiological basis of the immunity of cereals from rust. Leaves of oats and wheat affected by crown and brown rusts [*P. coronata* and *P. triticina*, respectively] contain higher amounts of urea and ammonia than healthy ones and the permeability of their cells is increased by the presence of these substances and toxins. In strong sunlight photosynthesis is reduced in rusted oats, loss of water is strikingly increased, and consequently the activity of assimilating organs lowered, but in weaker light the photo-

synthesis of the rusted plants is higher than that of healthy ones. The most harmful effect of the rust on the host is believed to be the increased loss of water. The rust is stated to be generally susceptible to its own toxins.

A. Y. Kokin (pp. 210–211) found in the course of comparative inoculation experiments on Brevit wheat that the type of infection produced by race 17 of *P. triticina* became less intensive with the increasing age of the plants, while that caused either by 20 or 65 was not modified by this factor. Plants infected by race 17 had a higher enzyme activity and transpiration rate than those infected by either of the other two. The absolute weight of 1,000 seeds from plants infected by races 17, 20, and 65 was, respectively, 12, 20, and 14·9 per cent. lower than that of the healthy control; the average number of seeds in one ear was 5, 2·6, and 2·5, respectively, as compared with 7 in the control.

Chester (K. S.) & Jamison (C.). **Physiologic races of Wheat leaf rust involved in the 1938 epiphytotic.**—*Phytopathology*, xxix, 11, pp. 962–967, 1939.

Analyses of 98 wheat leaf rust (*Puccinia triticina*) collections made in Oklahoma in 1938 disclosed races 13, 19, 77, and 9 (in decreasing order of prevalence) [*R.A.M.*, xviii, p. 731] as the principal sources of the exceptionally severe outbreak of the disease in the State in that year [ibid., xviii, p. 663]. Other races of minor importance were 20, 5, 18, 2, 52, 54, 12, 28, 31, 33, 43, 58, and 68. Judged by their effects on the standard assortment of eight varieties (Malakoff, Carina, Brevit, Webster, Loro, Mediterranean, Hussar, and Democrat), races 13, 19, and 9 [ibid., xii, p. 151] are all variants of the same race, the slight differences in the reactions of the sensitive Carina and Hussar being attributed to environmental factors in the greenhouse. Similar considerations apply to races 5 and 15. Race 77 induced in all the differential varieties symptoms of severe (type 4) infection and is regarded as potentially troublesome, being the most virulent of all the 109 races hitherto described and able to withstand sharp freezing. On the other hand, its relatively lengthy incubation period (one to two days longer than that of 13) may restrict its distribution in the field.

Of the 50 wheat varieties of superior germ plasm tested for their reactions to individual and collective inoculation by the races 13, 19, 9, 77, 5, and 2, the two showing the highest degree of resistance were Kawvale × Marquillo and Hope × Hussar. Of 75 species of wild grasses inoculated with *P. triticina*, only one, *Agropyron trichophorum*, contracted infection and produced uredospores, which were, however, incapable of attacking wheat.

Hart (Helen) & Allison (L. J.). **Toluene compounds to control plant disease.**—*Phytopathology*, xxix, 11, pp. 978–981, 1939.

A tabulated account is given of the writers' experiments at the Minnesota University Farm in the control of wheat stem rust (*Puccinia graminis*, race 56) by means of the following chemicals: borax (sodium borate) 0·64 gm. per sq. m. soil surface [*R.A.M.*, xv, p. 350], picric

acid (12 gm.), paratoluenesulphonylamide (1 gm.), and orthotoluenesulphonylamide (0·8 gm.) [ibid., xvii, p. 663]. The two last-named gave the most promising results, the incidence of infection in the susceptible Marquis being only 4 rusted plants out of 21 for ortho- and 8 out of 44 for paratoluenesulphonylamide, while the corresponding figures for Ceres (susceptible) were 4 out of 19 and 8 out of 37, respectively, and for Mindum (resistant) 0 out of 20 and 6 out of 42, respectively. The sole injury arising from the use of these compounds was a slight, definite but transient tip burning of the basal leaves. Picric acid caused moderate and borax severe foliar scorching, the incidence of rust for the former being as follows: Marquis 29 out of 38, Ceres 28 out of 40, and Mindum 10 out of 41, and for the latter 7 out of 20, 9 out of 22, and 0 out of 22, respectively, while the figures for the three untreated controls were 58 out of 63, 58 out of 64, and 58 out of 62, respectively. These data are considered to justify further experimentation with the two toluene compounds.

Hart (Helen) & Becker (Hanna). **Beiträge zur Frage des Zwischenwirtes für Puccinia glumarum.** [Contributions to the question of an alternate host for *Puccinia glumarum*.]—*Z. PflKrankh.*, xlix, 10–11, pp. 559–566, 1939.

Although an alternate host for the aecidial stage of yellow rust of cereals (*Puccinia glumarum*) is not essential for the perpetuation of infection in the Harz Mountains, Germany [*R.A.M.*, xix, p. 77], the constant appearance of new physiologic races is considered to point very strongly to the interposition of a sexual phase. Negative results, however, have so far been obtained in a search for such a stage.

Lange-De La Camp (Maria). **Ernährungsversuche mit Haplonten von Tilletia tritici.** [Nutrition experiments with haplonts of *Tilletia tritici*.]—*Kühn-Arch.*, xlviii, pp. 179–190, 2 pl., 1939.

Following up the analytical studies of Becker [*R.A.M.*, xv, p. 637], Holten [ibid., xvii, p. 804], Fittschen [ibid., xviii, p. 514], and others on the genetic basis of 'aggressiveness' in wheat bunt (*Tilletia tritici*) [*T. caries*], the author carried out a series of cultural experiments to determine the response of haploid lines from ten different spore collections to the incorporation with the medium (potato decoction with and without agar) of varying amounts of sugar candy and malt extracts, peptone, carbohydrates, and different sources of nitrogen.

Under the influence of peptone the development of the mycelium on the solid medium in all the lines was stimulated to great luxuriance, forming compact masses, often over 1 cm. in height, with a flat peripheral zone which disappeared at a concentration of 40 gm. per l. At the same time the colour of the colonies gradually changed from brown to white with increasing doses of peptone, the optimum concentration of which for the growth of all lines was 10 to 20 gm. per l. The absence of peptone was not counterbalanced by augmenting the dose of sugar candy extract. Sporidia were formed in profusion in liquid cultures on tap water plus 5 gm. peptone and 40 gm. sugar candy, or on potato decoction with or without the peptone and sugar candy. Malt extract, tested as a substitute for sugar candy, gave the best results at a con-

centration of 12·5 gm. per l. plus 5 gm. peptone. Of the sugars tested, only dextrose and saccharose [lactose according to the table on p. 186] were utilized by the fungus, the latter to a much more considerable extent than the former. Very poor growth was made in the presence of inorganic sources of nitrogen, while of the organic substances used with sugar candy in the experiments asparagin (2 gm.) was the strongest stimulant to sporidial growth, followed by nucleic acid and peptone, whereas allantoin was useless for the purpose in view.

White (N. H.). **The sexuality of Ophiobolus graminis Sacc.**—*J. Coun. sci. industr. Res. Aust.*, xii, 3, pp. 209–212, 1939.

Eight spores from each of three asci of *Ophiobolus graminis*, isolated from wheat in New South Wales [*R.A.M.*, xvii, p. 805], were cultured separately on potato dextrose agar. Each of these isolates gave rise to mature perithecia on transference to the roots of wheat plants grown in pure culture on nutrient agar, indicating that the fungus is homothallic [cf. ibid., v, p. 732].

Lundblad (K.). **Gulspetssjukan på Gisselås försöksgård. Resultat av en serie fältförsök åren 1928–1936.** [Yellow tip disease at the Gisselås experimental farm. Results of a series of field experiments 1928 to 1936.]—*Medd. svenska Vall-o. MosskFören.* 2, pp. 71–127, 1939. [German summary.]

A fully detailed, tabulated account is given of studies and experiments in progress since 1928 on the etiology and control of reclamation disease of cereals [*R.A.M.*, xviii, p. 613] and meadow grasses, including timothy (*Phleum pratense*), *Agrostis stolonifera*, and *Poa pratensis*, at Gisselås, Jämtland, northern Sweden, where the trouble was first observed about 15 years ago, shortly after the initial breaking-up of the ground for cultivation. It soon became apparent that the plants were unable to utilize the large quantities of nitrogen present in the peat soil, and attempts were made to overcome this difficulty by burning straw and by the application of nitrogenous fertilizers. These methods were to some extent successful and resulted in increased yields, but the disease persisted, a noticeable improvement being effected only by manuring with a mixture of ammonium sulphate and copper sulphate (200 and 100 kg. per hect., respectively) in addition to the standard 200 kg. superphosphate and 150 kg. potash, though a slight benefit was also derived from treatment with manganese sulphate (100 kg.). In 1936 the yield of the highly susceptible Svalöf's Vega oats was practically trebled by the incorporation of copper sulphate with the soil, all symptoms of the disease being simultaneously eliminated. Further trials are necessary to determine the best practical methods for the combined cure of reclamation disease and facilitation of nitrogen utilization under local conditions.

Vigliano (I. C.). **El 'fermentado' del Maiz, sus clases y sus causas.** [Maize 'fermentation', its types and its causes.]—*An. Soc. rur. argent.*, lxxiii, 8, pp. 703–704, 707–708, 3 figs., 1939.

Diplodia zeae is the agent of two types of maize rot or 'fermentation'

in the Argentine, one affecting the growing plant and the other the stored product. Popular descriptions are given of the symptoms induced by mild, moderately severe, and heavy attacks of the organism, the two latter entailing reductions in the seed weight from 35 gm. per 100 healthy seeds to 30 and 14 gm., respectively. In regions where *D. zeae* is prevalent infection of the threshed grain averages 2 to 3 per cent. of rotted seeds, but the fungus is estimated to cause a total loss of about 20 per cent. of the stand in diseased areas. Serious damage is further apt to occur in lightly infected maize stored under humid and otherwise unsuitable conditions, which may thus serve to perpetuate the rot. Although seed treatment and other cultural measures are highly desirable as aids in the control of *D. zeae*, a radical improvement in the situation can only be effected by genetic studies directed towards the development of resistant strains within the valuable indigenous varieties available for breeding.

Gooding (J. H.). **Effectiveness of ethyl mercury phosphate seed treatment results from two separate and distinct kinds of action.**—*Agric. News Lett.*, vii, 10, pp. 81–83, 1939.

In an address made at a meeting of the Independent Hybrid Seed Corn Producers in Illinois the author stated that new improved semesan jr [cf. *R.A.M.*, xvi, p. 444], though volatile, retains its effectiveness on maize seed during long storage periods because when the treated seed is exposed to the air in a bin, a sack, or in the soil, some of the ethyl mercury phosphate slowly forms a gas, while another portion of the mercurial is adsorbed by the seed coat, and cannot be separated from it by water in the form of rain or any other ordinary means. The product is designed to volatilize, in order that it may penetrate into every crack and crevice on the surface of the seed. No essential change has been made in the formula since new improved semesan jr was first introduced six years ago, but the odour has been changed to that of pine and the physical properties have been so modified that there is now little flying dust during treatment. The odour serves the useful purpose of warning the workmen when they are inhaling too much of the powder. As it contains only 1 per cent. ethyl mercury phosphate, the product is relatively safe to use.

Muller (H. R. A.). **Over het epidemisch optreden van de Gloeosporium-bladziekte bij Djeroek in Oost-Java.** [On the epidemic occurrence of the *Gloeosporium* leaf disease of Citrus in East Java.]—*Landbouw*, xv, 6, pp. 324–345, 16 figs., 1939. [English summary.]

An account is given of a destructive epidemic of withertip of citrus, especially oranges and tangerines, in East Java in 1938, caused by *Colletotrichum gloeosporioides* [*R.A.M.*, xviii, p. 794], which first attacks the young leaves and twigs and involves progressive defoliation and die back of the shoots. The incidence of the disease was found to depend largely on the state of health of the trees and on soil conditions, severe mortality being registered, for instance, after an intense drought, resulting in desiccation of the root systems, as well as in plantings where stony strata in the subsoil induced stagnation of growth: the adverse effects of the latter factor were particularly marked where the obstruc-

tion was encountered in the upper layers (78·6 per cent. infection compared with 39·6 in the deeper ones).

A connexion was suspected between the development of withertip and the application of sulphur to the citrus roots and surrounding soil for the control of *Armillaria* [loc. cit.], but definite proof of the absence of any such relationship was secured. Spraying with Bordeaux mixture against withertip is regarded as uneconomical, cultural methods of combating the disease being preferable. These should include, besides thorough sanitation of the groves, the substitution of bud-grafting for layering as a mode of propagation, the former tending to produce a vigorous root system capable of withstanding drought and neglect.

McCleery (F. C.). **Black spot of Citrus. A brief summary of control experiments, 1925–39.**—*Agric. Gaz. N.S.W.*, l, 11, pp. 618-622, 4 figs., 1939.

Black spot of citrus (*Phoma citricarpa*) [*R.A.M.*, xix, p. 69] is estimated to cause greater economic loss than any other disease on any crop in New South Wales. Its importance has increased with the increased cultivation of the late-hanging Valencia orange. If hot, dry weather prevails when the fruit reaches maturity early in October outbreaks may occur with great suddenness, and attacks may attain very serious proportions in a few days. Data obtained in spraying trials indicated that much infection occurs soon after blossoming, though the infected fruit appears healthy for as long as 12 months afterwards. The principal infection period probably extends from blossoming to a date some 20 weeks later.

In preliminary tests promising results were given by spraying with Bordeaux mixture at blossoming in October, while much better control was achieved when a second application (6–6–50 or 6–6–80) was made ten weeks later. Spray injury, however, was severe. Further experiments demonstrated that four applications at 3–3–80 yielded 81 per cent. clean fruit, 17 per cent. with trace-medium infection, and 2 per cent. severe infection compared with 13, 43, and 45 per cent., respectively, for the control, but caused severe fruit and tree injury. A profitable degree of control resulted from four applications at 1–1–80 (the corresponding infection percentages being 46, 39, and 16, respectively), this treatment causing no tree damage and giving fruit almost equal to the unsprayed controls in size, colour, and texture. Four applications at 3–3–80 gave better control than two at 6–6–80 and four at 2–2–80 were better than two at 4–4–80, while four at 1½–1½–80 were better than two at 3–3–80. The very weak sprays tended to hasten re-greening.

The spray programme recommended has already been noticed from another source [loc. cit.]. The Bordeaux treatment should be effected in conjunction with two white oil sprays against scale insects. Risk of spray injury is reduced if the trees are kept in a well-manured and vigorous condition.

Chapman (H. D.), Liebig (G. F.), & Parker (E. R.). **Manganese studies. California soils and Citrus leaf symptoms of deficiency.**—*Calif. Citrogr.*, xxiv, 12, pp. 427, 454; xxv, 1, pp. 11, 15, 5 figs., 1939.

The results of preliminary pot culture fertilizer tests carried out in

1937 on two soil types [*R.A.M.*, xviii, p. 672] in California with lucerne as an indicator crop showed that this crop benefited by applications of manganese to the soils in question. The published evidence of manganese deficiency symptoms in citrus leaves is stated to be somewhat discordant, and accordingly experiments were begun in 1937 with controlled nutrient cultures. Mild symptoms of manganese deficiency in the leaves of lemon cuttings were found to be indistinguishable from those of mild zinc deficiency; as the leaf grows older a stippling with lighter green points and spots commonly but not invariably appears, followed by a slight widening of the green band on either side of the midrib and main veins; small, white flecks produced by the apparent death of epidermal cells develop next, and finally numerous small, brown speckles spread mainly over the upper leaf surface, although some can be seen on the under side.

The mild symptoms produced on leaves of Valencia or sweet orange or grapefruit cuttings grown in the greenhouse in sand cultures supplied with manganese-deficient nutrient solutions maintained at P_H7 (found to contain no trace of soluble manganese) are said to resemble closely those of mild zinc deficiency (mottle leaf), but the lighter blotches remained less yellowish than in the true mottle leaf, and there was no material reduction in the leaf size or total growth of the plants. No symptoms developed in cultures maintained at P_H5, which were found to contain 0·06 p.p.m. of soluble manganese. A Navel orange tree grown for three years out-of-doors in a sand culture unit supplied with a nutrient solution maintained at P_H7 or above had consistently shown manganese deficiency symptoms, while trees grown in the same solutions but with the P_H lowered to 5 or 6 showed none. The leaves of the former had a manganese content of 7 p.p.m. as compared with 20 p.p.m. in those of the latter. The vegetative development of the affected tree was subnormal and the fruit production was markedly reduced, but leaf size was not significantly smaller and no die-back occurred. The leaves of manganese-deficient lemon and orange trees turned green upon treatment with manganese solutions, but zinc treatment had no effect.

Both orange and lemon trees growing in certain areas of southern California have been observed to show symptoms identical with those described above. Leaf analyses revealed a manganese content from 2·7 to 4·9 p.p.m., whereas green leaves from field trees in other areas showed values from 14 to 26 p.p.m. It is concluded that soil alkalinity is one of the factors giving rise to manganese deficiency, the condition being probably also determined by the quantities and kinds of manganese-bearing minerals native to the soils, cultural treatments, the manganese requirement of the crops grown, the phosphate status of the soil, and many other factors as yet not understood.

Klotz (L. J.) & Turrell (F. M.). **Rind structure and composition in water spot of Navel Orange.**—*Calif. Citrogr.*, xxv, 2, pp. 45, 56-57, 5 figs., 1939.

In this paper a discussion of rind anatomy is given in connexion with water spot in Washington Navel oranges [*R.A.M.*, xvii, p. 811]. The walls of the rind cells and the sap of these cells are stated to be very

hydrophilic, and the intercellular spaces, which are minute irregular conduits, also exert a powerful capillary attraction for water. When the waxy surface of the orange is damaged by mechanical injury and the underlying cells exposed, rain water is rapidly absorbed and the affected portion swells to form a blistered area, which may be readily invaded by the blue and green moulds [*Penicillium italicum* and *P. digitatum*]. Saturation of the rind tissues with water affects the semi-permeability of the membranes of the oil gland cells so that the toxic oil is liberated and further damages the tissues.

When untreated oranges were immersed in a 1/10,000 aqueous solution of ruthenium red, a pectin stain which traces the paths of entrance of the water, only a few of the stomata and cells of the substomatal chambers became stained, indicating that only few stomata permit the passage of water; when, however, the oranges were first treated with benzene and alcohol to remove the stomatal plugs and then immersed in the dye, many more stomata were stained. When oranges with uninjured rinds and with the buttons and navels sealed with paraffin were immersed in water together with an equal number of wounded oranges similarly treated with paraffin, the first lot had absorbed at the end of 16 hours 1·25 and the second 8·48 gm. of water, a result which indicates the small importance of stomata for the entrance of water.

No correlation was found between stomatal or oil gland density and the incidence of water spot.

Ciferri (R.). **Il marciume delle infiorescenze della Palma da Dattero nella Libia Occidentale.** [Inflorescence rot of the Date Palm in Eastern Libya.]—*Agricoltura colon.*, xxxiii, 10, pp. 571–572, 1939.

During a short visit to the oasis of Misurata, Libya, the author observed at the foot of a fully grown date palm an entire inflorescence in full flower which had become detached owing to a rotting of the rachid, separation having occurred at a point where the tissues had become soft and watery. Isolations from infected material in all cases gave *Fusarium moniliforme* [*Gibberella fujikuroi*: *R.A.M.*, xviii, p. 20] and another *Fusarium*, probably a variety of *F. oxysporum*, while in some instances bacteria, *Trichoderma lignorum*, and a Dematiaceous fungus, probably *Aureobasidium* [*Pullularia*] *pullulans*, were also found. The paper terminates with a brief review of the literature dealing with infections of date palms by species of *Fusarium* [cf. ibid., xvi, p. 744]. Further investigations are in progress.

Roelofsen (P. A.). **Onderzoekingen over beinvloeding en behoud van de kwaliteit van Robusta-Marktkoffie.** [Investigations on the operative factors in the retention of quality in Robusta market Coffee.]—*Arch. Koffiecult. Ned.-Ind.*, xiii, 3, pp. 151–281, 4 diags., 12 graphs, 1939. [English summary.]

The following items of phytopathological interest occur in this exhaustive survey of the factors involved in the preservation of the quality of coffee (mainly Robusta) from Java estates. Moulds (principally *Aspergillus niger*) were found to attack the green berries after two months' storage at a relative humidity of 75 per cent. and upwards. The natural colour gradually changes to yellow or brown and the

characteristic aroma is replaced by a musty odour; stored at 84 to 93 per cent. humidity the product becomes unfit for consumption, but at 63 per cent. it may safely be kept for 16 months without perceptible deterioration.

Miles (L. E.). **Some tests of varietal susceptibility to a combination of root-knot nematode and Cotton wilt.**—*Phytopathology*, xxix, 11, pp. 974–978, 1939.

Of 17 varieties of upland cotton grown on soil heavily infested with the root knot nematode (*Heterodera marioni*) and wilt (*Fusarium vasinfectum*) [*R.A.M.*, xviii, p. 787] at the Mississippi Agricultural Experiment Station, the highest degree of resistance to both organisms was shown by Clevewilt 6, Cook 144–68 and 307, Dixie Triumph 55–85, Toole (Perry), Sykes W.R., Dixie 14–5, and Dixie Triumph 12, the average percentage of fungal infection amounting to 18·53 as against 36·61 and 79·92 in the intermediate and susceptible groups, respectively. Of 14 exotic varieties and hybrids, one strain of Sea Island (13B3) remained free from wilt throughout the experiment, while another (Andrews) showed 9·61 per cent. infection. Similarly, one strain of Hopi (Sacaton 6 No. 2) contracted only 9·73 per cent. infection, while another (M–34–6–2 No. 6) was 100 per cent. diseased. The average incidence of wilt in the resistant group of exotic varieties was 13·20 as against 87·18 in the susceptible. Except for Sea Island 13B3 all the foreign varieties were liable to nematode infestation, which was particularly severe in the wilt-susceptible group.

Miles (L. E.). **Effect of type and period of storage on Cotton seed after treatment with organic mercury dusts.**—*Phytopathology*, xxix, 11, pp. 986–991, 1939.

In April, 1937, the average increases of emergence and yield in D & PL11A (Deltapine A) cotton seed treated at the Mississippi Agricultural Experiment Station with 2 per cent. ceresan over the untreated control lots stored for periods from 0 up to 5 months (*a*) in the laboratory were 26·9 and 26·7 per cent., respectively, and (*b*) in an outdoor crib 23·3 and 22, the corresponding figures for 2 per cent. new improved ceresan [*R.A.M.*, xviii, p. 787] being (*a*) 18·7 and 26·4 and (*b*) 30·6 and 26·4, respectively. In April, 1938, the average increases of emergence in two lots of ceresan-treated seed planted immediately after disinfection were 19·2 and 19·3 per cent. and of yield 25·4 and 15·8 per cent., the corresponding figures for new improved being 29 and 29·5 and 30 and 25·8, respectively. For two lots of ceresan-treated seed stored for 17 months, (*a*) in the laboratory and (*b*) in the crib, the average increases of emergence were 25·8 and 22·4 per cent., respectively, and of yield 25·5 and 28·7 respectively, the corresponding figures for new improved ceresan being 44·9 and 32·8, 39·1, and 32·6, respectively.

It is apparent from these data that neither the type nor the duration of storage caused injury from the treatment, but that the organic mercury dusts, especially new improved ceresan, substantially increased both emergence and yield even though the seed was relatively free from disease. Some factor other than the elimination of seed-borne infection was evidently involved in the production of this effect, probably the

reduction of an exceptionally high incidence of the soil-borne sore shin and damping-off (*Corticium solani*) [ibid., xviii, p. 105 and loc. cit.].

Watkins (G. M.) & Watkins (Matilde O.). **The pathogenic action of Phymatotrichum omnivorum.**—*Science*, N.S., xc, 2338, pp. 374–375, 1939.

When pure cultures of *Phymatotrichum omnivorum* [*R.A.M.*, xvii, pp. 523, 596; xix, p. 14] were maintained in successive transfers on roots of living cotton seedlings, and a fragment of infected root was placed against the root of a healthy seedling, shrinking and discoloration of the tissues of the healthy seedling adjacent to the piece of infected root generally resulted. This was followed by the development of an encircling and penetrating hyphal weft, which in two or three weeks produced a soft rot of the cortex along the whole root system.

Direct application of drops of liquid squeezed from affected roots was made on to the surfaces of normal cotton seedling roots, healthy roots in a parallel series being treated with drops expressed from diseased roots subjected to the temperature of boiling water for one hour, while similar tests were conducted with liquid expressed from germinating sclerotia. The results obtained showed that the liquid from the unheated, decayed roots was absorbed by healthy roots in four or five hours, and frequently imparted a water-soaked appearance to the tissue at the points of application. This affected tissue shrank, turned yellow or light brown, and formed sunken, necrotic areas, which girdled the root almost to the central cylinder; finally, the epidermis and cortex collapsed into a deeply staining, disorganized mass, while abundant cell division in the pericycle initiated the formation of lateral roots. In the roots treated with liquid from heated decayed roots only a slightly discoloured spot formed, and there was no considerable shrinkage or disruption of tissue continuity, though toxic effects were exerted on protoplasts near the site of application. The experiments with unheated and heated liquid from germinating sclerotia gave results comparable with the foregoing. Further evidence indicated that viable hyphae were seldom, if ever, transferred with the drops, and that the lesions that developed were due to fungal secretions.

Greathouse (G. A.). **Alkaloids from Sanguinaria canadensis and their influence on growth of Phymatotrichum omnivorum.**—*Plant Physiol.*, xiv, 2, pp. 377–380, 1939.

In a further study on the effect of alkaloids on the growth of *Phymatotrichum omnivorum* [*R.A.M.*, xviii, p. 24] the author isolated sanguinarine, chelerythrine, and protopine from roots and rhizomes of the resistant *Sanguinaria canadensis*. When these substances were added to the culture solution, sanguinarine was found to inhibit all growth of the fungus at all concentrations used (100, 50, 10, and 2·5 p.p.m.); chelerythrine acted similarly at concentrations of 100 and 50 p.p.m., but permitted a growth of 3·4 and 73 mg. at concentrations of 10 and 2·5 p.p.m., respectively, compared with one of 369 mg. in the control; while protopine, at the highest concentration, reduced the fungous growth to 81 mg. Both sanguinarine and chelerythrine were found to be present in the host tissues in far greater concentrations than those

inhibiting the growth of the fungus. These results indicate that alkaloids play an important part in the resistance of *S. canadensis* to *P. omnivorum*.

PASCALET (P.). **La lutte biologique contre Stephanoderes hampei ou Scolyte du Caféier au Cameroun.** [The biological control of *Stephanoderes hampei* or the *Scolytus* of Coffee in the Cameroons.]—*Rev. Bot. appl.*, xlix, 219, pp. 753–764, 1 fig., 1 graph, 1939.

A full account is given of the factors governing the successful control of the coffee berry borer (*Stephanoderes hampei*) in the Belgian Congo by spraying the infested bushes with a spore suspension of *Beauveria bassiana* [*R.A.M.*, xv, p. 150; xix, p. 72] from rice-peptone cultures. Prerequisite conditions for the establishment of fungal epidemics among populations of *S. hampei* include swarming of the insects; a temperature of 20° to 30° C.; an initial rainfall providing the parasite with the necessary moisture for intensive sporulation and stimulating the borers to settle on the bushes; a day or two of sunshine to reduce humidity and facilitate the uniform dispersion of the conidia by light air currents; and mists or light showers to promote the development of the conidia which have already reached the integument of females (the number of males attacked is negligible). On entering the body, either through the soft tissues at the insertion of the pronotum, or occasionally by way of the alimentary canal, the hyphae at first paralyse the movements of the insect and then exert a chemical action, killing the host after a maximum period of six days. For the present the problem of combating *S. hampei* by means of *B. bassiana* is considered to be of scientific rather than practical interest.

VIÉGAS (A. P.). **Empusa dysderci n.sp., um nuovo parassita de Dysdercus.** [*Empusa dysderci* n.sp., a new parasite of *Dysdercus*.]—*J. Agron., S. Paulo*, ii, 4, pp. 229–258, 3 pl., 1 fig., 1939. [English summary.]

A comprehensive account is given of the author's studies on a new species of *Empusa*, *E. dysderci* [a Latin diagnosis of which is furnished], parasitic in São Paulo, Brazil, on *Dysdercus mendesi*, *D. ruficollis*, *D. honestus*, and *D. longirostris*, the nymphs of the first instar being particularly susceptible, adults relatively resistant, and eggs completely immune. Infected insects show no apparent signs of abnormality before death, which occurs suddenly and is followed by the luxuriant development of conidiophores covering the entire body with a white bloom, gradually turning chamois-coloured; mummification eventually ensues.

The conidiophores are more or less cylindrical, smooth, hyaline, averaging 15 to 20μ in diameter, simple when developing on the dorsal surface of the nymphs, branched on adults; they originate at the tips of the 'hyphal bodies' or internal mycelium (17 to 58μ in diameter) and reach the exterior of the insect through the integument, which is dissolved by enzymatic action. The primary conidia are roughly globose, smooth, hyaline, multinucleate, 35 to 46 by 30 to 40μ, provided with a conspicuous basal papilla, and containing large oil drops; the secondary are similar but smaller. The zygospores produced in the interior of the tibial and tarsal regions and below the integument of the head are

globose, elliptical, smooth, hyaline, and measure 50 to 60μ in diameter. The mechanism of spore discharge in *E. dysderci*, which is positively phototropic, was ascertained to be analogous with that of *Pilobolus* [*R.A.M.*, xiv, p. 184], the conidia being transparent and acting as convergent lenses. A full description is given of the cytology of *E. dysderci*, which agrees with that of other species of the genus previously recorded.

Pure cultures of the fungus were obtained only with great difficulty on insects autoclaved for 20 minutes at 120° C. Its pathogenicity was demonstrated by laboratory inoculation experiments on *D. ruficollis* and *D. mendesi*, in which up to 100 per cent. infection was obtained, but the value of the organism as a means of combating the cotton-stainers in the field remains to be established by further investigations. The new species differs from the closely allied *E. apiculata* [ibid., xv, p. 779] in the absence of rhizoids.

Deschiens (R.). **Conditions de capture des larves de Dictyocaules par des Hyphomycètes prédateurs.** [Conditions for the capture of Dictyocaulous larvae by predatory Hyphomycetes.]—*Bull. Soc. Path. exot.*, xxxii, 7, pp. 698–700, 2 pl., 1939.

Pursuing the studies in progress at the parasitological annexe of the Institut Pasteur, Paris, on the capture of nematode larvae by certain Hyphomycetes [*R.A.M.*, xviii, p. 675], the writer studied the action of *Arthrobotrys oligospora* and *Dactylella bembicodes* on *Dictyocaulus filaria*, the agent of verminous bronchitis in sheep and goats. The fungi were grown on an agar-water medium on to which larvae of various ages were introduced. *Dactylella bembicodes* proved capable of 'garrotting' even the feebly motile embryos of the nematode, while those of the second and third moults were readily captured and strangled. *A. oligospora* was somewhat less actively predacious but effectively disposed of the second- and third-moult larvae. The profuse development of the fungi in question on damp grass, mire, and the surface of stretches of water renders them eminently suitable for prophylactic application in the control of bronchitic strongylosis of ruminants.

De Monbreun (W. A.). **The Dog as a natural host for Histoplasma capsulatum. Report of a case of histoplasmosis in this animal.**—*Amer. J. trop. Med.*, xix, 6, pp. 565–586, 3 pl., 1939.

A detailed account is given of the writer's studies (with the assistance of Katherine Anderson) at the Nashville (Tennessee) General Hospital on a case of generalized infection in a dog by a fungus proved to be identical with *Histoplasma capsulatum* [*R.A.M.*, xix, p. 20] in all its phases both in the host tissues and in culture on potato dextrose agar at P_H 6·5 and Sabouraud's medium; it was characterized by hyphae 2·5 to 4·5μ in diameter, intercalary or lateral, sessile or pedicellate, sometimes concatenate chlamydospores, 4 to 10μ in diameter, lateral, sessile or pedicellate, piriform conidia, 2 to 8μ in diameter, and terminal, lateral, or intercalary, spherical or rarely piriform, thick-walled cells, 10 to 25μ in diameter, and covered with rounded projections or tubercles, 5 to 6μ long, radiating from the surface. The yeast-like form of the fungus did not develop on 10 per cent. rabbit blood agar either at room temperature or at 37° C., but was obtained in culture

from the peritoneal tissues of mice inoculated with mycelial suspensions. Infection was transmitted to dogs and puppies by feeding them on cultures of the fungus.

The author has received private information of a number of other cases of histoplasmosis from the unpublished records of physicians, and believes the disease to be more widely prevalent in the United States than the relevant literature suggests. *H. capsulatum* should be sought for in blood films, biopsies of lymph nodes, and in cultures of blood and lymph nodes in obscure cases of splenomegaly and lymphadenopathy.

Solway (L. J.), Kohan (M.), & Pritzker (H. G.). **A case of disseminated blastomycosis.**—*Canad. med. Ass. J.*, xli, 4, pp. 331–336, 5 figs., 1939.

The organism found to be responsible for a fatal case of generalized blastomycosis [which is fully described] in a 48-year-old Italian fruit-vendor at Toronto was identified in pure culture as *Zymonema dermatitidis* or *Blastomyces gilchristi* [*Endomyces dermatitidis*: *R.A.M.*, xix, p. 20].

Baker (R. D.). **The effect of Mouse passage on cultural characteristics and virulence for Mice of organisms causing blastomycosis.** —*Amer. J. trop. Med.*, xix, 6, pp. 547–562, 2 pl., 1939.

In the writer's experiments at the Duke University (North Carolina) School of Medicine, repeated transfer through white mice failed to enhance the virulence towards these animals of two strains of *Blastomyces* [*Endomyces*] *dermatitidis* [see preceding abstract] which had caused human blastomycosis. The yeast form of the two strains was developed from the mycelial stage as readily by direct growth on 10 per cent. rabbit blood agar at 37° C. as by passage through a mouse. No alterations, moreover, were induced in the cultural characters of the strains by the latter process. Several mice revealed evidence of generalized blood stream dissemination of the pathogen.

Baldacci (E.), Ciferri (R.), & Vaccari (E.). **Revisione sistematica del genere Malbranchea Sacc.** [A systematic revision of the genus *Malbranchea* Sacc.]—*Atti Ist. bot. Univ. Pavia*, Ser. IV[a], xi, pp. 75–103, 15 figs., 1939. [Latin and English summaries.]

This is an expanded account of a paper already noticed from another source [*R.A.M.*, xviii, p. 526]. The systematic position of the genus *Malbranchea* is among the Conidiosporales according to Vuillemin's classification, and according to Saccardo's in the group Hyphales-Mucedinaceae-Oosporeae.

Ferrando (M.) & Ceruti (A.). **Ricerche sulla flora micologica dello stomaco in varie gastropatie.** [Researches on the mycological flora of the stomach in various gastric diseases.]—*G. Batt. Immun.*, xxiii, 4, pp. 481–512, 1939. [French, English, and German summaries.]

A number of fungi (including *Cryptococcus hominis* [*Debaryomyces neoformans*: *R.A.M.*, xviii, p. 800]) were isolated from the gastric juices of ten patients suffering from various disorders of the stomach at the

Turin University Hospital. No evidence was obtained, however, that the organisms play any significant part in the etiology of gastric disturbances.

Bizzarri (M.). **Rilievi in 'vivo' di particolari forme degenerative della 'Blastocystis hominis'.** [The demonstration *in vivo* of special degenerative forms of *Blastocystis hominis*.]—*Pathologica*, xxxi, 577, pp. 475–476, 1939. [German and English summaries.]

In the intestinal tract of a patient suffering from blastocystosis (*Blastocystis hominis*) [*R.A.M.*, xviii, p. 676] the writer detected bodies of all dimensions ranging from minute to 'gigantic', those of fairly large size (17·6 μ in diameter) preponderating. The large forms are considered to represent a degenerative stage of the fungus.

Dowding (Eleanor S.) & Levey (M. R.). **A mould from the ear.**—*Canad. med. Ass. J.*, xli, 4, pp. 336–339, 10 figs., 1939.

Comparative descriptions are given of *Mucor circinelloides*, a relatively uncommon soil mould [*R.A.M.*, xvi, p. 710; xviii, p. 137] isolated at the University of Alberta, Edmonton, from the ear of a nurse, and two other species previously isolated from the same site, viz., *M. corymbifer* [*Absidia corymbifera*: ibid., xvii, p. 678] and *M. ramosus*. Both *A. corymbifera* and *M. circinelloides* made profuse growth on sterilized ear wax. *M. circinelloides* further resembles *A. corymbifera* in its abundant development at a high temperature (57° C.) and in its pathogenicity to intravenously inoculated rabbits, from the kidneys and liver of which the fungus was recovered.

Minchew (B. H.), Collins (B. E.), & Harris (M. M.). **External ear diseases.**—*J. med. Ass. Ga.* xxviii, 10, pp. 408–412, 1939.

Ten out of 50 patients in Georgia suffering from external ear troubles [*R.A.M.*, xviii, p. 313] yielded fungus cultures, of which eight were identified as *Aspergillus* and two as *Penicillium*.

Sasaki (H.). **Über die Otomycosis, besonders ihre Pilzarten, mit Ausnahme der Aspergillusarten.** [On otomycosis, especially the fungi associated with it, other than species of *Aspergillus*.]—*Fukuoka Acta med.*, xxxii, 10, pp. 1573–1644, 10 pl., 1 fig., 1 graph, 1939. [Japanese, with German summary on pp. 97–98.]

Otomycosis is stated to be more prevalent in Japan than is generally realized, constituting 2·1 per cent. (47 cases) of all the patients treated for ear diseases at Fukuoka in 1936. Apart from *Aspergillus* [see preceding abstract], the following fungi were involved in the etiology of the disease, viz. *Penicillium jantho-citrinum* (11 cases), not previously reported from the ear, *P. eborinum* n.sp. (1), *Scopulariopsis sasakianus* n.sp. (1) [both without Latin diagnoses], *Mycotoruloides alba* (3), and its var. *furcellata* (1).

Castellani (A.). **A brief note on a strain of Monilia (Candida) zeylanoides Cast., isolated from a case of moniliasis of the toes.**—*J. trop. Med.* (*Hyg.*), xlii, 19, pp. 292–295, 6 figs., 1939.

Candida zeylanoides [*R.A.M.*, viii, p. 104; xviii, p. 254], isolated from

a case of moniliasis of the toes, is characterized by blastospores normally ranging from 2 by 1 to 6 by 4·5 (average 4 by 2·6) μ but attaining dimensions of 7·5 by 4·5 μ in the condensation water of glucose agar cultures. The fungus is Gram-negative, non-acid-fast, does not liquefy gelatine or coagulate serum, peptonize milk, or produce gas from any of the substances tested; litmus milk is slightly alkalized; acid is formed from glucose, levulose, maltose, galactose, saccharose, and inulin. A deep brownish-black pigmentation develops in a week in arbutin agar cultures kept at 30° C. Positive results were obtained in an inoculation experiment on the foot of a human volunteer. The taxonomy of the fungus in relation to other members of the *C. zeylanica* group [loc. cit.] and allied organisms is briefly discussed.

Pulvertaft (R. J. V.) & Walker (J. W.). **The control of air-borne bac[illi] and fungus spores by means of aerosols.**—*J. Hyg., Camb.*, xxxix, 5, pp. 696–704, 1939.

In an attempt at the Westminster Hospital School of Medicine to develop a method of atmospheric purification applicable to fungus spores, the presence of which in factories and the like is stated to be a source of almost incalculable loss in industry, quite apart from their deleterious effect as agents of allergic disease, the writers conducted experiments with the following organisms: two strains of *Cladosporium herbarum* (reported to have been detected, with various *Penicillium* spp., at an average rate of three spores per l. in a cold storage installation [cf. *R.A.M.*, xviii, p. 468]), *Mucor racemosus*, *Thamnidium elegans*, *Wardomyces anomala* [ibid., iii, p. 52], *Torula botryoides*, *Sporotrichum carnis* [ibid., xviii, p. 180] (all isolated from refrigerators), *Monilia sitophila* [ibid., xvii, pp. 243, 599], *P. commune*, *Mucor adventitius*, and *Aspergillus niger*. Powdered desiccated cultures on 2 per cent. maltose agar were divided into two parts, one of which (controls) was distributed about the test chamber by means of a strong current of air; after a 30-minute interval, plates were exposed for 15 minutes. The other part was similarly distributed and an aerosol composed of resorcinol [ibid., xv, p. 166] and glycerine and sold under the trade name of 'aeryl' introduced into the atmosphere at a concentration of 1 : 500,000; at the end of half an hour plates were exposed for 15 minutes and incubated at 20° C. for 100 hours before counting the colonies.

Although complete sterilization was obtained only in the case of *T. botryoides* and *S. carnis*, the colonies of which on the control plates numbered 184 and 275, respectively, substantial reductions were obtained with the other fungi also, e.g., the numbers of the two strains of *C. herbarum* fell from 'confluent growth' (over 500 colonies) to 38 and 24, respectively, *M. racemosus*, *T. elegans*, and *M. adventitius* to 4, 2, and 6, respectively, and *A. niger* from 450 to 8.

Gohar (N.). **Mycosis v. pseudomycosis : a record of some fungi isolated in Egypt.**—*J. trop. Med.* (*Hyg.*), xlii, 15, pp. 229–234, 1 graph, 1939.

The author presents a record of miscellaneous fungi isolated from various human disorders in Egypt, and suggests that, in some cases, a diagnosis of true mycosis may be based on scientifically unconvincing

evidence. For instance, none of the species cultured from the sputa of 100 patients suffering from 'bronchomycosis' seemed to have any bearing on the condition. Five cases of tinea cruris unexpectedly yielded *Trichophyton concentricum* [*R.A.M.*, xviii, p. 678], hitherto associated with tinea imbricata. Post-mortem cultures from a case of sprue yielded *Syringospora* [*Candida*] *psilosis* [ibid., xvii, p. 395]. The data presented are regarded as constituting strong grounds for scepticism as to the causal involvement of such species in the diseases under discussion.

Jacobson (H. P.). **Immunotherapy for coccidioidal granuloma.**—*Arch. Derm. Syph., Chicago*, xl, 4, pp. 521–540, 1939.

Following a review of the literature on the attempted therapy of coccidioidal granuloma (*Coccidioides immitis*), the writer describes ten out of over twenty cases (including that of Farness and Mills) [*R.A.M.*, xviii, p. 800] which he has successfully treated by means of specific vaccines.

Moore (W. C.). **Diseases of bulbs.**—*Bull. Minist. Agric., Lond.*, 117, 176 pp., 58 figs., London, H.M. Stationery Office, 1939. 4*s.* net.

This valuable, clearly illustrated treatise presents in a readable form the latest available information on fungal, bacterial, virus, and non-parasitic diseases of flowering bulbs, much of the literature published on which during the last 60 years is stated to be confined to scientific periodicals or written in foreign languages. The work is divided into sections dealing with the history, geographical distribution, symptomatology, and control of the various diseases affecting Liliaceae (including the hyacinth, tulip, and lily), Amaryllidaceae (*Narcissus* and snowdrop), and Iridaceae (including gladiolus, iris, and crocus) and with the morphology and taxonomy of the causal organisms. The bibliography comprises 709 titles.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, l, 11, pp. 623–627, 1939.

During the winter and spring of 1939, carnations in New South Wales were affected by a bud rot, first recorded locally in 1935, and causing a loss of £500 to one grower in 1937, in which the affected buds resembled healthy ones partially open, but were decayed, brown, and mouldy inside. The condition was associated with *Sporotrichum* [*Fusarium*] *poae* [*R.A.M.*, vi, p. 395; xi, p. 647; xiv, p. 512], a mite, and sometimes with common moulds, such as species of *Alternaria* and *Stemphylium*. Inoculations with the *Fusarium* reproduced the disease, but no injury resulted when the mite was introduced into the flower-beds. Growers are recommended to remove and burn all affected buds and flowers.

Wenzl (H.). **Echter Mehltau auf Cyclamen persicum.** [True mildew on *Cyclamen persicum*.]—*Z. PflKrankh.*, xlix, 10–11, pp. 566–567, 1939.

Cyclamen persicum petals in a Vienna nursery were attacked during the winter of 1938–9 by a mildew causing discoloration, shrivelling, and shedding of the uninfected corollate leaves after flowering. In the

absence of a perfect stage the fungus, which is characterized by elliptical conidia, 30 to 50 by 11 to 20 (average 38 to 44 by 13 to 18) μ, can be identified as an apparently undescribed species of *Oidium*, to be known pending further studies as *O. cyclaminis* [a name proposed without a Latin diagnosis].

Lona (F.). **Nuovi casi di tracheoverticilliosi su Digitalis lanata e Santolina chamaecyparissus.** [New cases of tracheoverticilliosis on *Digitalis lanata* and *Santolina chamaecyparissus*.]—*Atti Ist. bot. Univ. Pavia*, Ser. IV[a], xi, pp. 273–288, 10 figs., 1939. [Latin and English summaries.]

The author reports the presence of a *Verticillium* causing tracheoverticilliosis [cf. *R.A.M.*, x, p. 757] on the rose, apricot, *Digitalis lanata*, and *Santolina chamaecyparissus* in Italy, the last two hosts apparently being new records for this disease.

A detailed account is given of the wilt as affecting *D. lanata*. Each of the affected plants studied showed the presence of two strains of the fungus, the cultural characters of which remained constant and which inoculation tests showed to be equally pathogenic. One strain, referred to as 'a', did not produce sclerotia, while the other, 'b', produced abundant olivaceous-black sclerotia and well-developed aerial hyphae. According to G. H. Berkeley's classification [cf. ibid., vii, p. 301] strain 'a' would fall into the third group, which produces no black discoloration in culture, while 'b' falls into the *V. dahliae* group. According to Wollenweber, however [ibid., ix, p. 6], strain 'b' corresponds to *V. albo-atrum* and 'a' belongs to var. *caespitosum*.

Jenkins (A[nna] E.), Polhamus (L. G.), & Hill (H. H.). **New hosts and distribution of Elsinoe solidaginis.**—*Phytopathology*. xxix, 11, pp. 970–973, 1 fig., 1 map, 1939.

Since the first report of scab (*Elsinoe solidaginis*) on golden rod (*Solidago* spp.) in the southern part of Florida [*R.A.M.*, xv, p. 231], the disease has been recorded from a number of other localities in the same State, Georgia, and South Carolina. The following are tabulated as new hosts of *E. solidaginis*: *S. altissima*, *S. bicolor*, *S. brachyphylla*, *S. caesia*, *S. canadensis*, *S. juncea*, *S. rugosa*, *S. petiolaris*, *S. serotina* and its var. *gigantea*, and *S. ulmifolia*, of which *S. serotina* is the most susceptible, while certain strains of *S. leavenworthii* under comparable conditions appear to be almost completely resistant. The perfect stage of the fungus was further present in abundance on a specimen of *S. fistulosa* sent from Savannah in 1936. A local representative of the Compositae, *Brachychaeta sphacelata*, also contracted severe infection by *E. solidaginis* in the Plant Introduction Garden at Savannah, Georgia.

McCulloch (Lucia) & Pirone (P. P.). **Bacterial leaf spot of Dieffenbachia.**—*Phytopathology*, xxix, 11, pp. 956–962, 1 fig., 1939.

Dieffenbachia picta, an attractive ornamental becoming increasingly popular in the United States, has recently been observed to suffer from a destructive foliar wilt affecting all parts of the leaf blade except the midrib. Infection first appears in the form of circular to elongated

spots, up to 1 cm. in diameter, with dull watery-green centres, orange-brown borders, and irregular outer margins, delimited by the veins. When the lesions are numerous and conditions favourable for the disease, coalescence into large, yellow, wilted, dry areas takes place. At this stage the dead leaves are dull tan or light brown, thin, and tough, and the lesions are covered on the lower, and later to some extent also on the upper, surfaces by a waxy, silvery-white, thin layer of exudate.

The pathogen, seven isolates of which fulfilled Koch's postulates, is a bacterium consisting of single or paired rods, the former measuring 0·9 to 2·8 (mostly 1 to 1·5) by 0·3 to 0·4 μ. It is motile by a single polar flagellum, capsulate on media containing starch or dextrose, aerobic, Gram-negative, non-acid-fast, liquefying gelatine and blood serum, producing a moderate amount of hydrogen sulphide and ammonia, but no indol (in tests by the Goré method); nitrates are not reduced, starch is hydrolysed to a limited extent, milk slowly peptonized, and litmus reduced. The colonies on beef-peptone agar at 23° to 25° C. are circular, entire, flat, smooth, thin, and translucent, massicot or Naples yellow, attaining a diameter of 2 to 4 mm. in six or seven days. The bacteria made their optimum growth at 30° to 31°, the minimum and maximum temperatures being 5° and 37° to 38°, respectively, and the thermal death point 48°. Desiccation rapidly killed the pathogen, while direct sunlight was lethal in five minutes at 3° to 5°. The organism is named *Bacterium* (or *Phytomonas*) *dieffenbachiae* n.sp.

Viégas (A. P.). **Tomentella bambusina n.sp., causadora da seca do Bambú.** [*Tomentella bambusina* n.sp., the agent of Bamboo wilt.]—*J. Agron., S. Paulo*, ii, 5, pp. 313–326, 1 pl., 1939.

Bamboos (*Bambusa vulgaris*) in a planting at Piracicaba, São Paulo, Brazil, were observed in September, 1938, to be affected by a disease characterized by yellowing of the culms, drooping of the bracts, and shrivelling of the whole plant. Young shoots suffer most severely, becoming completely desiccated. The roots are also invaded, the cortex being entirely rotted and only the central cylinder remaining more or less intact. During the dry season the white to ashen, farinaceous hymenium of the causal organism, which is considered to be a new species of *Tomentella* and named *T. bambusina* n.sp. [with a Latin diagnosis], is conspicuous on the dry bracts of the infected shoots, and with the onset of the rains the mycelium develops in profusion round the culm bases and even on the fallen bracts. The disease appears to be the same as the destructive shoot-rot reported by Whetzel from Bermuda (*Rep. Dep. Agric. Bermuda*, 1921, pp. 36, 39–40, 1922) as due to a *Rhizoctonia*.

T. bambusina, a member of the Thelephoraceae, forms a sub-hymenium 5μ in thickness, bearing clavate, erect, smooth, hyaline basidia, 30 by 7·5 to 8μ, each producing four hyaline, depressed, spherical, slightly echinulate basidiospores, 8·5 to 9μ in diameter, each provided with a basal papilla 2μ in height and germ pore 1·2 to 1·5μ in diameter. It was isolated in pure culture and inoculated into young bamboo shoots either through wounds or applied directly to the uninjured surface, with positive results in the former case only. The pathogen appears to pass from the rainy to the dry season in the

mycelial stage in the bracts, which after 24 to 28 hours in a moist chamber develop the above-mentioned typical white to ashen areas, and if left for a longer period exhibit the persistent, white, flocculent mycelium.

Donald (C. M.). **Strain variation in Bromus unioloides H.B. et K. (Prairie Grass).**—*J. Coun. sci. industr. Res. Aust.*, xii, 3, pp. 212–226, 1939.

In connexion with a study at the Waite Agricultural Research Institute, Adelaide, on variations in *Bromus unioloides*, resulting in the differentiation of eight distinct types of the pasture grass, mention is made of the frequency of infection by smut (*Ustilago bromivora*) [or *U. bullata*: *R.A.M.*, xvii, p. 45; xviii, p. 441]. All the types examined were either completely susceptible to, or entirely immune from, the smut. Of 54 lines tested, 42 were predominantly of the five types susceptible to smut. In a test in 1937 to determine the relative value of different seed treatments for the control of the disease, infection was totally eliminated by 100 minutes' immersion in hot water (120° F.) and by dusting with an experimental mercurial preparation containing ethyl mercury phosphate as the active principle at the rate of 3 oz. per bush., while formalin, copper carbonate, and ceresan gave 87, 53, and 95 per cent. control, respectively [ibid., xiv, p. 572].

Lindfors (T.). **En för Sverige ny sotsvamp.** [A smut fungus new for Sweden.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1939*, 4–5, pp. 68–69, 1 fig., 1939.

Attention is drawn to the recent detection, for the first time in Sweden, of *Sphacelotheca* [*Ustilago*] *panici-miliacei* on millet (*Panicum miliaceum*) [*R.A.M.*, xviii, p. 170], one of the fodder grasses newly introduced into the country for experimental purposes.

Bitter pit in Apples.—*Fruit World, Melbourne*, xl, 10, p. 5, 1939.

In response to an enquiry by the Victorian Fruit Marketing Association F. M. Read states that if Granny Smith apples are cooled immediately after picking the onset of bitter pit [*R.A.M.*, xviii, p. 118] is often delayed for several months. In a discussion on this subject at a meeting of the Association W. M. Carne stated that in this variety liability to bitter pit and scald [ibid., xviii, p. 657] is greatest in immature fruit, and the former condition is also associated with light crops and large fruit. Both disorders can be prevented by avoiding immaturity; in most years, Granny Smith apples should not be exported from Victoria before the middle of March. Light-crop trees should be picked about a fortnight later than heavy-crop trees, small fruits on light crops being more susceptible than larger fruits from heavier crops. As a rule, light-crop fruit is unsuitable for export or long storage. Finally, oiled wraps prevent scald but not bitter pit.

Hockey (J. F.). **Comparisons of orchard fungicides, 1938.**—*Rep. N.S. Fruit Grs' Ass.*, lxxv, pp. 53–55, 57–58, 1938. [Received January, 1940.]

In 1938, when a most severe outbreak of apple scab [*Venturia*

inaequalis] in Nova Scotia took place as a sequel to a rainfall of nearly 1 in. from 14th to 17th May, the delayed-dormant and pre-pink sprays were the most important in the one-third acre experimental plots of Gravenstein, McIntosh, Cox's Orange, and Wagener, each of which received six fungicidal treatments beginning on 9th May and ending on 7th July. The lowest percentage of foliar infection (0·7) was registered on the plot treated with Bordeaux-iron mixture, and the highest proportion of clean fruit (88·8, 84·7, and 83 per cent. on Gravenstein, McIntosh, and Wagener, respectively) on that sprayed with Bordeaux-catalytic sulphur. The inclusion of lead arsenate in the lime-sulphur sprays definitely enhanced their fungicidal efficiency, which was otherwise not equal to that of Bordeaux mixture in the early treatments. Lime-sulphur-iron sulphate mixture [*R.A.M.*, xi, p. 252], catalytic sulphur, flotation sulphur, and sulphur paste exerted about the same degree of efficacy in scab control on Gravenstein and McIntosh, but the two latter afforded less complete protection to the late variety, Wagener. The spray schedule producing the maximum of clean fruit on all varieties consisted of two Bordeaux sprays followed by four applications of a mixture of 1 gal. lime-sulphur, 4 lb. catalytic sulphur, and 3 lb. lead arsenate in 100 gals. water.

VANDERWALLE (R.). **Un cas de verticilliose sur Cognassier.** [A case of verticilliosis on Quince.]—*Bull. Inst. agron. Gembloux*, viii, 2, pp. 106–110, 2 figs., 1939. [Flemish, German, and English summaries.]

Quince seedlings imported from Holland and France and growing in Belgian nurseries have been found to be affected by a tracheomycosis apparently due to *Verticillium dahliae* [*R.A.M.*, xvi, p. 756]. As the disease was present only sporadically it is assumed that in most cases the seedlings were affected when they were imported. During the first year in the nursery, towards the end of vegetation, the leaves of the affected seedlings turned yellow, withered, and fell prematurely. Grafts, as they developed, at first appeared normal, but during the summer their vegetation became arrested and a progressive withering set in. Affected stems showed a brown discoloration of the wood, sometimes confined to one side of the stem; the discoloration generally spread upwards to the thinnest branches and also extended downwards to the collar.

The fungus isolated from affected material in pure culture on beerwort did not give the *Verticillium* form, but produced conidiophores bearing oval-oblong, agglomerated conidia of the *Cephalosporium* type, measuring 3·75 to 5·5 by 2·5 to 3μ. The abundant microsclerotia were characteristic of *V. dahliae* [ibid., xi, p. 130]. On this medium the hyphae were hyaline or brown. On Raulin's medium the *Verticillium* form constantly developed, and microsclerotia were abundantly present. On Coons's medium development was closely similar to that on Raulin's.

HAHN (G. G.). **Immunity of a staminate clone of Ribes alpinum from Cronartium ribicola.**—*Phytopathology*, xxix, 11, pp. 981–986, 1 fig., 1939.

In order to verify the hypothesis that the conflicting reports of specific

reaction of *Ribes alpinum* to blister rust (*Cronartium ribicola*) [*R.A.M.*, xviii, p. 772] are due to individual differences in this respect between pistillate and staminate plants, observed but not stressed by Clinton and Miss McCormick [ibid., iv, p. 375], the writer inoculated a clone each of the staminate and pistillate plants in 1937 and 1938 at Yale University, New Haven, Connecticut, with aecidiospores of the rust collected in Connecticut and Maine. All the 2,754 leaves of the staminate clone proved to be immune, whereas those of the pistillate contracted infection. The staminate individuals did not even develop the necrotic foliar flecks associated with blister rust infection on the immune Viking (Norwegian Red Dutch) [ibid., xviii, p. 323], whereas the susceptible American Red Dutch controls bore necrotic lesions and produced teleutosori in small numbers.

Menor (J. G.). **Enfermedades del Plátano, del Guineo y del Rulo** [Plantain, Banana, and 'Rulo' diseases.]—*Rev. Agric., S. Domingo*, xxx, 118, pp. 340–342, 10 figs., 1939.

Popular notes are given on the symptoms of three diseases commonly affecting bananas in the Dominican Republic, viz., bacterial wilt or 'moko' (*Bacterium solanacearum*) [*R.A.M.*, xvi, p. 656], desiccation of the foliage with partial involvement of the stem associated with *Helminthosporium torulosum* and *Cordana* [*Scolecotrichum*] *musae* [ibid., xviii, p. 328], and Panama disease (*Fusarium* [*oxysporum*] *cubense*) [ibid., xvii, p. 730], together with directions for their control. Fungal desiccation is amenable to control by spraying with Bordeaux mixture (2 to 4 lb. per 50 gals., with an adhesive) except in very severe cases, necessitating eradication with gas oil.

Ciferri (R.) & Gaddini (L.). **Il marciume delle Musa da Bacterium solanacearum nell' oasi di Derna.** [The rot of *Musa* species caused by *Bacterium solanacearum* in the oasis of Derna.]—*Agricoltura colon.*, xxxiii, 9, pp. 531–535, 5 figs., 1939.

The two varieties of bananas grown commercially at Derna, Libya, one a local variety and the other the Alexandrian banana (*Musa cavendishii*) are both affected by a disease which reduces the total crop by about 10 per cent. per annum. From infected material an organism was isolated the characters of which agreed with those of *Bacterium solanacearum* [cf. *R.A.M.*, xviii, p. 693]. A full description of the symptoms of the disease is given and the paper terminates with brief suggestions for control by improved cultural practices.

Kanitkar (U. K.) & Uppal (B. N.). **Twig blight and fruit rot of Mango.** —*Curr. Sci.*, viii, 10, pp. 470–471, 1 fig., 1939.

Mangoes in Bombay are affected during the monsoon by a disease which produces rapidly enlarging water-soaked areas on the twigs. The infection quickly spreads upwards, but the twig is never girdled. The affected bark turns dark brown, and the shoot dries up. Diseased material showed the presence of ostiolate pycnidia, 88 to 248μ in diameter (in culture, 56·8 to 145·5μ), with hyaline pycnospores, 16·5 to 26·1 by 4·8 to 6·9μ. The disease causes a black rot of fruits in storage, especially at the stalk end.

An apparently new species of *Phoma* was isolated from naturally affected bark and fruits, and inoculations with pure cultures of the fungus on wounded stems and fruits gave positive results. One- to two-year-old green twigs of Pairi and Alphonso mangoes were highly susceptible, while younger shoots and those with mature bark failed to take infection. Twigs of country varieties were highly resistant.

Thurston (H. W.) & Frear (D. E. H.). **The importance of standardized procedures in diluting liquid lime-sulphur.**—*Phytopathology*, xxix, 11, pp. 993–995, 1939.

Recent analyses at the Pennsylvania State College of 30 samples of lime-sulphur concentrate comprising eight commercial brands and five home-made preparations revealed far-reaching variations both in the specific gravity (1·182 to 1·293) and the polysulphide content (10·90 to 25·94 per cent.). To cite two examples, a dilute (1 in 75) spray made from the preparation of highest specific gravity would contain 0·445 per cent. polysulphide sulphur, or more than 2½ times as much as that of the lowest (0·171). The proportions of thiosulphate sulphur in the various samples ranged from 1·71 to 6·05 per cent., high concentrations of this compound generally accompanying a low specific gravity and polysulphide content [cf. *R.A.M.*, xvii, p. 333]. Of the five home-made samples, all but one (which was the best of the whole number examined) were definitely inferior to the commercial brands, the average polysulphide and thiosulphate sulphur contents of the former being 16·70 and 4·05 per cent., respectively, and the corresponding proportions of the latter 22·61 and 2·32 per cent., respectively.

Muskett (A. E.). **Biological technique for the evaluation of fungicides.** —Reprinted from *Agric. Progr.*, xvi, 2, 6 pp., 1939.

This is a condensed account of work already noticed from another source [*R.A.M.*, xvii, p. 809].

Hibben (S. G.). **Short-wave radiation in the control of fungi and bacteria.**—*Agric. Engng, St Joseph, Mich.*, xx, 11, p. 438, 1939.

The peak of the lethal action of radiant electric energy on micro-organisms [*R.A.M.*, xix, p. 84] occurs at a wave-length of about 2,250 Å (a quality of radiation not found in sunlight at the earth's surface), and during the last few years, which have been marked by an immense increase of interest in the practical applications of the process, it has been necessary to perfect low-pressure mercury vapour discharge lamps supplying a uniformly regulated output of energy in the requisite form [cf. ibid., xv, p. 722]. The cost of installation of a sterilizing lamp unit about 3 ft. long and complete with reflector and controlling accessories is estimated at $30. Well-made ultra-violet tubes are capable of six months' continuous burning, and the electric power consumption is quite low, four 30-inch lamps requiring no more than a single 75-watt lighting bulb. In meat storage chambers the combination of direct and general space irradiation (the latter entailing the application of four lamps to a floor area at the rate of 300 to 400 sq. ft. or 750 cu. ft. air per lamp) has proved effective under proper conditions of humidity and ventilation, while good results have also been obtained

in the control of moulds in bakeries and other branches of food industry [ibid., xvii, p. 418].

Dodge (B. O.). **Some problems in the genetics of the fungi.**—*Science*, N.S., xc, 2339, pp. 379–385, 1939.

In this paper (presented at the Third International Congress for Microbiology, New York, 1939) the author discusses some of the chief problems of myco-genetics, including mutations and segregations in bakery moulds, mendelism in yeast fungi, phenotypic and genotypic sex differences, and double fertilization in Ascomycetes.

Babcock (E. B.). **Recent progress in plant breeding.**—*Sci. Mon., N.Y.*, xlix, 5, pp. 393–400, 1939.

This is a review of some recent outstanding developments in the breeding of plants for resistance to disease and other purposes in the United States, among the diseases discussed from this standpoint being watermelon wilt [*Fusarium bulbigenum* var. *niveum*], black stem rust of wheat [*Puccinia graminis tritici*], and tobacco mosaic.

Verhoeven (W. B. L.). **Overzicht van de belangrijkste ziekten en plagen van landbouwgewassen en hun bestrijding.** [A survey of the most important diseases and pests of agricultural crops and their control.]—*Versl. PlZiekt. Dienst Wageningen* 92, 174 pp., 16 pl., 1939.

This booklet clearly sets out the symptoms of the most important diseases of agricultural crops in Holland, those associated with potash deficiency being described by H. Lindeman. Practical control measures are indicated while a concluding section deals, *inter alia*, with seed disinfection and the preparation of some standard fungicides.

Plant diseases.—*ex* A Handbook of Philippine Agriculture, Coll. Agric., Univ. Philippines, pp. 233–342, 1939.

Brief, practical notes are given on the symptoms, causes, and control of the principal diseases of crop plants in the Philippine Islands.

Sheffield (F[rances] M. L.). **Some effects of plant virus diseases on the cells of their hosts.**—*J. R. micr. Soc.*, Ser. III, lix, 3, pp. 149–161, 3 pl., 1939.

Further investigations into the effects of plant virus diseases on the host cells [*R.A.M.*, xviii, p. 468] showed that some cause no apparent abnormalities, while others lead to the development of inclusion bodies, which in some cases are amorphous, and in others crystalline. The different types of inclusion are compared, and the paper concludes with a discussion of the nature of intracellular inclusions. The plates accompanying the present paper include a number of new illustrations.

Kausche (G. A.). **Über Färbungsmöglichkeiten von pflanzlichem Virus.** [On the staining possibilities of virus material of plant origin.]—*Biol. Zbl.*, lix, 9–10, pp. 536–541, 3 figs., (2 col.), 1939.

Details are given of the procedures adopted in the staining of the common and aucuba tobacco mosaic virus and potato virus X by means of silver nitrate and Victoria blue (Herzberg) [*R.A.M.*, xviii, p. 556].

Stanley (W. M.). **The architecture of viruses.**—*Physiol. Rev.*, xix, 4, pp. 524–556, 1939.

The author develops the thesis (with particular reference to plant viruses) that it is more fruitful to consider atoms, molecules, viruses, germs, and cells from the point of view of structure than by reference to the living state.

Baldacci (E.) & Cabrini (Elisa). **Biologia di una Rizottonia usata nelle ricerche di vaccinazione (Rhizoctonia solani var. ambigua nobis).** [The biology of a *Rhizoctonia* used in researches on vaccination (*Rhizoctonia solani* var. *ambigua* nobis.]—*Atti Ist. bot. Univ. Pavia*, Ser. IV[a], xi, pp. 23–73, 13 figs., 1939. [Latin and English summaries.]

A full account is given of the authors' morphological, cultural, and physiological studies on the 'toile' disease organism, hitherto regarded as *Botrytis cinerea* [*R.A.M.*, xvii, p. 55] (received through Carbone from Beauverie).

The authors conclude that the fungus in question is a variety of *Rhizoctonia solani*, which they name *R. solani* var. *ambigua* [cf. ibid., xviii, p. 757]. Their reasons for regarding it as a separate variety are (1) that it has become so well known in connexion with plant vaccination studies; (2) it differs from *R.* [*Corticium*] *solani* in the absence of a perfect stage, its non-pathogenicity to potato, its physiological characters, and its lack of zonation in culture; and (3) the measurements of the monilioidal cells differ from those of *Moniliopsis aderholdi*, which the authors regard as synonymous with *C. solani* [ibid., xvii, p. 184].

The studies on plant vaccination carried out with this fungus by different workers should now be revised in the light of the data adduced in the present paper.

Yarwood (C. E.). **Relation of moisture to infection with some downy mildews and rusts.**—*Phytopathology*, xxix, 11, pp. 933–945, 1939.

The author's inoculation experiments at California University in 1938 with the downy mildews of onion (*Peronospora destructor*) [*P. schleideniana*: *R.A.M.*, xviii, p. 778], spinach (*P. effusa*) [ibid., xix, p. 62], hops (*Pseudoperonospora humuli*) [ibid., xvi, pp. 439, 627, *et passim*], cucumber (*P. cubensis*) [ibid., xv, p. 197], and the rusts of clover (*Trifolium pratense*), beans (*Phaseolus vulgaris*), *Antirrhinum majus*, and sunflower caused by *Uromyces fallens* [ibid., xiv, p. 174], *U. phaseoli* [*U. appendiculatus*: ibid., xix, p. 59], *Puccinia antirrhini* [ibid., xviii, p. 740], and *P. helianthi* [ibid., xviii, p. 128], respectively, were generally most successful when dry spores were dusted on to dry leaves and the infected plants were incubated in moist chambers at a constant temperature. The hop and cucumber mildews, however, were markedly less virulent on the dry foliage than on that to which water was applied by atomization. The infection data were not appreciably modified by the maintenance of the inoculated plants in dry soil or by the use of desiccated spores as inoculum, though some reductions in the number of lesions on unatomized leaves were obtained by the treatments.

Detached *A. majus*, bean, and sunflower leaves in moist chambers

contracted more infection by *P. antirrhini*, *U. appendiculatus*, and *P. helianthi*, respectively, when the inoculated surface was turned downwards than when it faced upwards during the incubation period. The lower temperature in relation to the surrounding atmosphere generally registered by onion leaves kept outdoors at night or in dark moist chambers (0·23°±0·07° to 0·75°±0·071°) is believed to be mainly responsible for the condensation of moisture on the leaves and the resultant favourable conditions for infection. In a humid atmosphere the relatively low leaf temperature is usually sufficient to cause the deposition of enough moisture to induce germination and infection with the fungi studied, but with *Pseudoperonospora humuli* and *P. cubensis* a greater amount of free moisture is probably necessary than with the other species.

DYKSTRA (T. P.). **A comparative study of American and European Potato virus diseases.**—*Amer. Potato J.*, xvi, 11, pp. 281–287, 1939.

This is an abridged version of the author's comparative studies on certain American and European potato viruses, a full account of which has already been noticed [*R.A.M.*, xviii, p. 337]. Of the viruses investigated, all those of European origin except paracrinkle and C were also found to occur in the United States. Leaf-rolling mosaic (virus E) has not been reported from Europe.

DYKSTRA (T. P.). **A study of viruses causing yellow mosaics in European and American varieties of the Potato, Solanum tuberosum.** —*Phytopathology*, xxix, 11, pp. 917–933, 7 figs., 1939.

In this paper the author continues his studies on American and European potato virus diseases [see preceding abstract] by describing his experiments with viruses of the yellow mosaic group. It is concluded that the viruses causing pseudo-net necrosis (from Holland), tuber blotch (from Ireland), and European and American aucuba mosaic are closely related (as was claimed by Clinch and her colleagues [*R.A.M.*, xvi, p. 117]), and that the first two diseases are identical. A hitherto undescribed disease from Canada, tentatively designated Canada streak, is shown to belong to this group, while evidence is presented that American potato calico [ibid., xi, p. 320] is caused by a virus of an unrelated type.

The X-immune seedling 41956, inoculated with the Canada streak virus, sometimes exhibited a blotchy mottling of the lower foliage resembling aucuba, while in other cases stem necrosis and burning of the veins and petioles were observed. Bliss Triumph contracted aucuba mottling of the leaflets and considerable necrosis of the intermediate leaves. In the early stages the second-generation symptoms on Earliest of All, inoculated with Canada streak, were characterized by rugosity of the leaves, which tended to roll downwards, the veins of the lower ones becoming necrotic; the general aspect was suggestive of rugose mosaic. The necrotic spots on the foliage of large plants were reminiscent of early blight [*Alternaria solani*], except for the absence of concentric rings; some yellow blotches also appeared. On Green Mountain the symptoms corresponded in the main with those observed on Earliest of All. The lower leaves of infected Irish Cobbler were

extensively spotted and soon fell, the top ones bore yellow blotches, and there was appreciable stem necrosis, involving the cortex and pith. The intermediate leaves of Chippewa bore necrotic dried areas, but showed scarcely a trace of aucuba mosaic. On the other hand, President developed typical aucuba symptoms on the upper leaves, accompanied by necrosis of the lower and intermediate foliage. The lower leaves of Epicure were chlorotic, but there were no necrotic blotches or streak, whereas Arran Victory showed both aucuba-like symptoms and necrosis. Arran Chief developed particularly severe injury, consisting of scorching and the ultimate shedding of nearly every leaf. The tubers of all varieties revealed an internal blotchy necrosis, originating in the pith, often at the stem end, and in severe cases extending throughout the tuber. These symptoms were not as a rule apparent until about two months after harvesting. Tobacco plants inoculated with Canada streak displayed irregular, white blotches on the upper leaf halves. Young pepper [*Capsicum annuum*] plants contracted foliar and stem necrosis and died within 20 days, while older ones shed their leaves but remained alive. In *Nicotiana glutinosa* the top leaves bore characteristic aucuba spots and the intermediate ones brownish, dried areas, while in *N. sylvestris* shrivelled lesions, 2 mm. in diameter, and small, circular spots appeared on most of the leaves. Serological tests by K. S. Chester confirmed the suspected relationship of Canada streak and aucuba mosaic.

The literature on each disease is briefly summarized.

Loughnane (J. B.). **Myzus ornatus a vector of Potato viruses.**—*Nature, Lond.*, cxliv, 3653, pp. 785–786, 1939.

In three experiments carried out in Dublin, out of 16 healthy potato plants colonized with *Myzus ornatus* from a leaf roll source, 10 developed leaf roll. In two tests of the insect as a vector of potato virus Y, 5 out of 16 healthy potato plants colonized became affected with this virus. As the insect has been found only to a very slight extent feeding on field potato crops in Eire it is probably unimportant as a vector of potato viruses under field conditions. It has, however, been observed on a wide range of hosts, and may, therefore, act as a vector of viruses of other crops.

KenKnight (G.) & Muncie (J. H.). **Isolation of phytopathogenic Actinomycetes.**—*Phytopathology*, xxix, 11, pp. 1000–1001, 1939.

The following technique has been found effective at the Michigan Department of Plant Pathology for the isolation of *Actinomyces* [including *A. scabies*] from potato scab [*R.A.M.*, xix, p. 111] lesions and is also applicable to Actinomycetous infections on the roots of other hosts. Diseased tubers are thoroughly washed in tap water, immersed for one minute in 0·1 per cent. mercuric chloride, rinsed, the scab lesions excised with a flamed scalpel, placed in a sterile, cotton-plugged test tube, broken up with a glass rod dipped in alcohol, and shaken with 10 c.c. sterile water. One-tenth to 1 c.c. of the suspension, diluted with 10 c.c. sterile water, is transferred to a Petri dish containing about 20 c.c. of a medium consisting of 1 gm. glucose, 1 c.c. of a 10 per cent. solution of each of potassium dihydrogen phosphate, sodium nitrate, potassium

chloride, magnesium sulphate, and 15 gm. agar per l. distilled or tap water, adjusted to a neutral reaction. The substitution of 1 gm. per l. soluble starch for glucose results in slightly more prolific growth of the Actinomycetes, but the elimination of the fungal and bacterial contaminants commonly present in scab lesions is less complete with this component.

BEELEY (F.). **Annual Report. Pathological Division.**—*Rep. Rubb. Res. Inst. Malaya, 1938*, pp. 115–143, 2 figs., 1939.

This report [cf. *R.A.M.*, xvii, p. 836] contains the following items of interest. The results of large-scale experiments on the treatment of plots of *Hevea* rubber showing root disease (*Ganoderma pseudoferreum*, *Fomes lignosus*, and *F. noxius*) [loc. cit.] before replanting are given by R. P. N. Napper. It was shown that root disease control in connexion with replanting consists of two separate problems, namely, control (*a*) in the infected areas in the original stands for which *G. pseudoferreum* is mainly responsible, and (*b*) in areas outside the old disease patches carrying healthy trees (where *F. lignosus* is the fungus to cause trouble subsequently). A separate study of these two problems on the same site showed, according to expectations, that the rate of incidence of *G. pseudoferreum* provides a measure of relative efficiencies of the different replanting methods in dealing with problem (*a*), and varies inversely with the amounts of digging carried out within the boundaries of the original disease patches, whereas the rate of incidence of *F. lignosus* provides the parallel measure in dealing with problem (*b*) and varies inversely with the amount of digging carried out outside those boundaries. The only exception was the low incidence of *F. lignosus* in plots in which all trees were cut off at ground-level and the stumps poisoned with sodium arsenate. This method is useless for destroying already infected roots but may be of considerable practical value for control in areas outside the original diseased stand. Poisoning hastens the onset of decay and consequently shortens the period between felling and invasion by saprophytic organisms, during which the roots are highly susceptible to attacks by *F. lignosus*. By shortening this period of susceptibility fewer and smaller sources of infection are allowed to develop, with a corresponding reduction of losses in the replanted stand.

The rhizomorphs of *F. lignosus* spread far in advance of the rotten tissue, and the ratio of the number of dead to the total number of infected (both living and dead) trees at the end of 1938 was 43 : 104, the corresponding figures for *G. pseudoferreum* and *F. noxius*, the rhizomorphs of which rarely advance beyond the diseased tissue, being 8 : 9 and 6 : 8, respectively. Nearly 60 per cent. of the *F. noxius* infections were directly traceable to contact with diseased rubber logs, which had probably become infected after felling by means of wind-blown spores. Generally the costs of treatment during the first year after planting varied inversely with the cost of treatment prior to planting; the costs for stump poisoning were significantly heavier than those for the other treatments.

On coastal soils the replanting problem was chiefly limited to problem (*b*), as only *F. lignosus* was present. In addition to treatment by digging and by the poisoning method, ring-barking (based on Leach's

work on *Armillaria mellea* [ibid., xvi, p. 564]) was tried, and though data regarding disease are not yet available, it was found that ringing 4½ months before felling resulted in a reduction of the starch content of the roots by 5½ per cent. after 3½ to 4 months and by 86 per cent. after 6 months. Trees frill-grilled and poisoned 4 months before felling showed a loss of 98 per cent. after 5½ months, whereas in untreated stumps it was only 4 per cent. during the first 2½ months. There was a fairly close relationship between the rate of loss of starch and the rate of invasion by saprophytic fungi.

In the course of investigations conducted by F. Beeley, mouldy rot (*Ceratostomella fimbriata*) [ibid., xvii, p. 836] was observed in the rare perithecial stage on the tapping panel of rubber trees on an estate in South Perak in July, while the normal dense, white felt of endoconidia was absent. The palm-oil treatment in control of this disease was found to have certain disadvantages, such as slipperiness of the tapping surface, tendency to over-softening of the bark, and decomposition of the palm oil, which, with the sun's heat, causes an over-penetration of the new bark surfaces, killing at least 1 mm. thickness of bark.

Brown bast [ibid., xvii, p. 414] was reported from several areas of budded rubber. The early stages of this physiological disease occur during the dry period between two moist ones and are not easily recognizable, while when the more obvious symptoms appear following a growth flush, prevention is already practically impossible and drastic surgical treatment must be applied. An indication of over-tapping is afforded, however, by an increase in the percentage of dry or brown bast trees in an area above the normal 3 to 5, accompanied by a decrease in the dry rubber content of the latex. If the dry rubber content is examined regularly throughout the period of tapping, serious outbreaks of the disease can be prevented by shortening the length of the cut or increasing the intervals between tappings. On many estates daily records are made of the volume and the dry rubber content of the latex brought in by each tapper, so that changes in the composition of the latex and an onset of the disease can be at once detected.

James (N.). **The accuracy of the plating method for estimating the number of bacteria, Actinomyces, and fungi in a laboratory sample of soil.**—*Iowa St. Coll. J. Sci.*, xiv, 1, pp. 50–52, 1939.

This is a condensed account of work already noticed from another source [*R.A.M.*, xviii, p. 614].

Stark (F. L.), Smith (J. B.), & Howard (F. L.). **Effect of chloropicrin fumigation on nitrification and ammonification in soil.**—*Soil Sci.*, xlviii, 5, pp. 433–442, 4 graphs, 1939.

The effect of soil fumigation with chloropicrin [*R.A.M.*, xviii, pp. 439, 728] on the subsequent rate of ammonification and nitrification was studied in a very fine sandy loam soil at the Rhode Island Agricultural Experiment Station. The total amount of nitrogen made available for plant growth was not substantially increased except by high dosages of chloropicrin, the beneficial effect of which as a soil fumigant is therefore probably due in a large part to the control of undesirable microorganisms, especially fungi [ibid., xv, p. 518]. Plants cultivated in the

treated soil develop extensive, fibrous, uninjured root systems, the vigorous activity of which is reflected in heavy increases of yield, amounting for instance to 50 per cent. in carrots and onions and to double the normal in pepper [*Capsicum annuum*], tomato, and eggplant.

HOERNER (G. R.). **Calcium cyanamide as a crown treatment.**—*Pacif. Hop. Gr.*, v, 11, p. 7, 1938. [Abs. in *Exp. Sta. Rec.*, lxxxi, 6, p. 798, 1939.]

From 52 replies to a questionnaire circulated to hop-growers in British Columbia, California, and Oregon, it appeared that, generally speaking, the application before hoeing of calcium cyanamide to the soil surface over the crowns at the rate of 2 oz. per plant in a circle about 2 ft. in diameter resulted in good control of downy mildew [*Pseudoperonospora humuli*: *R.A.M.*, xiii, p. 396; xvi, p. 439] through the suppression of the basal spikes, besides increasing yields.

BELL (A. F.). **Corn, downy mildew, and Cane.**—*Cane Grs' quart. Bull.*, vii, 1, pp. 43–44, 1939. [Abs. in *Facts ab. Sug.*, xxxiv, 12, p. 35, 1939.]

Recent observations in Queensland have demonstrated the readiness with which downy mildew [*Sclerospora sacchari*] can pass from maize to sugar-cane [*R.A.M.*, xviii, p. 549], a fact of special importance in connexion with the P.O.J. 2878 and 213 varieties, valued largely for their resistance to gumming disease [*Bacterium vasculorum*: ibid., xix, p. 116]. The menace of diseased maize to the neighbouring cane crops lies in the rapid spread of the fungus in the former. One infected maize stalk may contaminate the entire crop in a few weeks, whereas not less than a couple of years would be necessary to bring about a similar effect in cane. Thus, by keeping maize at a distance, downy mildew may be excluded from the cane fields or controlled by the immediate eradication of infected stools as they appear.

GUFFROY (C.). **Glanures mycologiques. II.** [Mycological gleanings. II.]—*Bull. Soc. mycol. Fr.*, lv, 2, pp. 159–165, 1939.

A list is given of 61 parasitic fungi (mostly Ascomycetes and rusts) and their hosts found by the author in different parts of France.

BALȚATU (G.). **Mycoderma als echte Saccharomyceten.** [*Mycoderma* spp. as true Saccharomycetes.]—*Zbl. Bakt.*, Abt. 2, ci, 9–13, pp. 196–225, 3 pl., 7 figs., 1939.

A detailed account is given of the writer's intensive morphological and cytological studies at the Geisenheim (Rhine) Viticultural and Horticultural Experiment and Research Station on 17 strains of *Mycoderma* [*R.A.M.*, xiv, p. 193]. The results of the investigations are considered to leave no doubt as to the position of *Mycoderma* in the tribe Saccharomyceteae of the Stelling-Dekker system [ibid., x, p. 692]. It is proposed to retain *Mycoderma* as a genus with *Mycoderma*, *Pichia*, *Willia*, and possibly *Debaryomyces* as subgenera, the designations of individual species being founded on their predominant ascospore numbers, followed by an index figure, e.g., *M. tetraspora* I (= *M. vini* 15), and *M. bispora* III (= *M. cerevisiae*).

Tai (F. L.). **Notes on Chinese fungi, IX.**—*Lingnan Sci. J.*, xviii, 4, pp. 457–462, 4 pl., 1939.

This annotated list of 16 Chinese true mildews [cf. *R.A.M.*, xvi, p. 840; xviii, p. 552] includes *Leveillula* [*Oidiopsis*] *taurica* on chilli [ibid., xiv, p. 146] and *Erysiphe glycines* n.sp. [with Latin and English diagnoses] on *Glycine* sp. The latter fungus is closely allied to *E. polygoni*, from which it differs, however, in its subcylindrical asci, 63 to 71 by 29 to 33 μ, each occupied by six, rarely eight, ellipsoid to oblong ascospores, 20 to 24 by 10 to 13 μ.

Savile (D. B. O.). **Nuclear structure and behavior in species of the Uredinales.**—*Amer. J. Bot.*, xxvi, 8, pp. 585-609, 106 figs., 1939.

In a cytological study of *Uromyces fabae*, *Puccinia sorghi* [*P. maydis*], *P. malvacearum*, and five other rusts, it was shown by means of the usual and some new staining methods that there are two distinct types of nucleus in this group of fungi, the unexpanded and the expanded. The former is found in the pycnospores and is adopted in every part of the life-cycle where migration of the nucleus through a narrow pore is necessary, while the second occurs in the aecidiospores, uredospores, and teleutospores, and in their basal cells and spore mother cells. The transition of the unexpanded into the expanded nucleus begins with the formation of a new nuclear sphere, the ectosphere, round the original nucleus, then the chromatin passes through the original nuclear membrane and becomes distributed throughout the ectosphere, leaving the original nuclear sphere, the endosphere, completely devoid of it. The endosphere is commonly referred to as the nucleolus, but it is not homologous with the nucleolus of higher plants. With the aid of the Feulgen method, nuclear division was followed in greater detail than was previously possible. In the unexpanded nucleus the spindle is formed equatorially in the single nuclear sphere, while in the expanded it is formed beside the endosphere as a chord to the ectosphere membrane. The division of the nuclei of the mycelium is essentially similar to that of the unexpanded nuclei. It was established that the pycnospore nuclei of *P. maydis* and *U. fabae* enter the thallus through the ostiolar hyphae of the pycnidium. They do not diploidize the cells through which they pass, and though very few introduced nuclei enter each aecidial primordium, complete diploidization is achieved by repeated division after the primordium has been reached.

Tranzschel (W [V].). **Conspectus Uredinalium U.R.S.S.**—426 pp., 37 figs., Leningrad, published by the Academy of Sciences of the U.S.S.R., 1939. Roub. 19 Kop. 20 (bound Roub. 21 Kop. 70).

This monograph opens with a few introductory chapters (pp. 7–57) on the development, taxonomy and nomenclature, host relationships, and geographical distribution of the rust fungi. These are followed by a list of the rusts recorded in the U.S.S.R. (pp. 61–404), together with a certain number of foreign species (given in square brackets) which might be found in the Union later on, as their hosts are present in the country. The rusts are listed first under the hosts arranged according to the natural orders, the localities being indicated, and following each order an annotated list is given of the rusts parasitic on it. A number

of species regarded as new are described [with Latin diagnoses] and various new combinations made. The work constitutes a valuable addition to the Russian literature on the rusts.

Doidge (E[thel] M.). **South African rust fungi, III.**—*Bothalia*, iii, 4, pp. 487–512, 37 figs., 1939.

In continuation of her earlier work [*R.A.M.*, vi, p. 257], the author gives descriptive notes on 43 further species of South African rusts, including 29 new species [with Latin diagnoses] and one *nomen novum*. *Puccinia iridis* [ibid., xvii. p. 397] is recorded as having recently appeared on *Iris germanica* growing in gardens in Johannesburg and *Uromyces limonii* on *Limonium latifolium* in commercial gardens in Pretoria and Hartebeestpoort.

Bugnicourt (P.). **Les Fusarium et Cylindrocarpon de l'Indochine.** [The *Fusarium* and *Cylindrocarpon* species of Indo-China.]—(*Encycl. mycol.*, Vol. XI), 206 pp., 10 pl. (6 col.), 36 figs., Paris, Paul Lechevalier, 1939. Fr. 165.

For seven years the author has been isolating species of *Fusarium* and *Cylindrocarpon* from the major crops, the forest trees, the food plants, and the ornamentals of Indo-China. From this material he presents a detailed description of 29 species, varieties (2 new), and forms of the first, and 10 species, of which 8 are new, of the second. Five associated perithecial forms are also described. He regards the genus *Fusarium* as adequately covered by the 65 fundamental species with their varieties and forms, as maintained by Wollenweber [*R.A.M.*, xiv, p. 708]. A notable feature of the present work, however, is the large number of new host plants from which established forms of *Fusarium* have been isolated for the first time, e.g., all the 15 host plants of *F. vasinfectum*, 27 out of the 28 of *F. equiseti* var. *bullatum* [ibid., xvii, p. 154], and 41 out of the 42 of *F. solani* var. *minus* [ibid., xiv, pp. 297; xvi, pp. 174, 813]. The microscopic features of each form are illustrated in text figures or microphotographs, and the macroscopic features of 16 selected forms in the coloured plates. The particulars of each form are set out as follows: (i) the accepted name and its synonyms; (ii) the host plants from which it has been isolated in Indo-China; (iii) its world distribution and the hosts from which it has been previously recorded; (iv) its macroscopic characters drawn up from at least five subcultures as its grows on a number of different media; and (v) its macroconidia, microconidia, and chlamydospores treated separately. The spore measurements, taken from at least 500 spores, are tabulated in classes according to the number of septa, and are repeated for isolations from a number of different host plants. This work will no doubt be a valued addition to the literature on *Fusarium* and *Cylindrocarpon*.

Martin (L. F.), Balls (A. K.), & McKinney (H. H.). **Protein changes in mosaic-diseased Tobacco.**—*J. biol. Chem.*, cxxx, 2, pp. 687–701, 4 graphs, 1939.

In a previous paper the writers indicated the principle of a method for the differentiation of the trypsin-resistant virus nucleoprotein of tobacco mosaic from the trypsin-digestible normal protein [*R.A.M.*,

xviii, p. 480], and they here give full directions for the application of two alternative procedures for the determination of protein changes in diseased plants, together with the results obtained thereby.

After the inoculation of young Wisconsin-Havana plants with tobacco virus 1 the virus protein at first accumulates by the displacement of an equivalent amount of normal proteins. After three days in the lower and six in the upper leaves, a very rapid increase in virus protein concentration begins, accompanied by a rise in total nitrogen and total protein, and by the appearance of macroscopic symptoms. The maximum concentration of total virus protein in the lower leaves (about 34 mg. per gm. dry weight) was attained five days after inoculation, the corresponding figures for the upper being approximately 43 mg. and ten days. A gradual decline in the concentration of virus protein then ensued, while the normal protein reverted to the level found in the healthy controls. In the very resistant Ambalema variety the same sequence of changes took place in a less pronounced form, the non-digestible virus protein disappearing much earlier after reaching a maximum concentration of only a third of that detected in the susceptible Havana. The extremely resistant Type 448A did not respond to inoculation by the accumulation of virus protein in measurable amounts. The latter variety also showed a consistent decrease in the total nitrogen content as a result of infection in place of the characteristic increase in the susceptible Havana. Neither Ambalema nor Type 448A manifested any external symptoms during the period of the tests.

In general, the amounts of virus indicated by the assays of sap infectivity on Scotia bean [*Phaseolus vulgaris*] by the half-leaf inoculation method paralleled the analytical data as to the relative quantities of virus protein in the susceptible, very resistant, and extremely resistant genotypes.

The observations herein described may be interpreted on the basis either of direct conversion of normal into virus protein, or of competition of normal and virus protein syntheses for available nitrogen, coinciding with an acceleration of the total nitrogen assimilation and protein synthesis.

WENHOLZ (H.). **Spotted wilt of Tomatoes. Breeding for resistance.**—*Hawkesbury agric. Coll. J.*, xxxvi, p. 103, 1939. [Abs. in *Plant Breed. Abstr.*, x, 1, p. 15, 1940.]

At the Hawkesbury Agricultural College [New South Wales], N. I. Shirlow is crossing cultivated tomatoes with *Lycopersicum pimpinellifolium* in order to obtain resistance to spotted wilt [*R.A.M.*, xviii, p. 825], and another apparently immune Peruvian species is also under observation. Antibes and a few other varieties have so far remained free from the disease under local conditions.

HORSFALL (J. G.) & MCDONNELL (A. D.). **Effect of wind on blossom-end rot of Tomatoes.**—*Plant Dis. Reptr*, xxiii, 18, pp. 307–308, 1939. [Mimeographed.]

The effect of wind in aggravating outbreaks of blossom-end rot of tomatoes [*R.A.M.*, xviii, p. 637] was illustrated by counts made in a

field in Connecticut. The tomato rows ran at right angles to the direction of the wind, and the plants were trained on stakes 5 ft. high. The number of affected fruits per 50 ft. of row was 42 in the outside row most exposed to the wind, the figures for the next six rows being, respectively, 27, 17, 12, 4, 9, and 5.

WELLMAN (F. L.). **A technique for studying host resistance and pathogenicity in Tomato Fusarium wilt.**—*Phytopathology*, xxix, 11, pp. 945–956, 1 fig., 1 diag., 1939.

A laboratory-greenhouse technique has been devised at the United States Horticultural Station, Beltsville, Maryland, for the study both of the pathogenicity of the tomato wilt organism (*Fusarium bulbigenum* var. *lycopersici*) [*R.A.M.*, xix, p. 7] and the relative resistance to the disease of strains and varieties of the host. The seedlings were grown for four to six weeks in sterilized soil in a warm greenhouse (27° C.), and the inoculum was derived from cultures of the fungus grown on Tochinai's liquid medium (10 gm. peptone, 0·5 gm. monopotassium phosphate, 0·25 gm. magnesium sulphate, 20 gm. maltose, and 1,000 c.c. water). After washing, the roots were dipped in the inoculum and planted out in sterilized soil (2 parts of coarse sand to 1 of potting soil) at a temperature of 25° to 28° in a greenhouse atmosphere of 24° to 30°. The period required for the establishment of host-fungus reactions in growing plants in the test beds averaged about a week. The severity of the disease was determined by means of a system of numerical evaluation ranging from 0 (no apparent disease) to 15 (early wilt and collapse).

The following are some of the observations made on this basis in seven tests. A few plants of the resistant Red Currant variety showed fairly severe symptoms a week after inoculation, but shortly outgrew them and proceeded to develop normally. Some of the tolerant Marglobes showed similar reactions, though others remained mildly stunted throughout the full period (39 days) of the observations, and certain badly affected plants died within 17 days. The susceptible Bonny Best was killed in 7 to 28 days, and in some instances plants of this variety displayed virulent symptoms as early as four days after inoculation.

BAKER (R. E. D.). **Notes on the diseases and fruit rots of Tomatoes in the British West Indies.**—*Trop. Agriculture, Trin.*, xvi, 11, pp. 252–257, 1939.

In 1939 the following organisms were found associated with rots of tomato fruits in Trinidad [*R.A.M.*, xi, p. 609; xii, pp. 121, 794], St. Vincent, and Montserrat, the fruit being picked when full but still green and then allowed to ripen at 75° to 85° F.: *Bacillus* [*Erwinia*] *aroideae*, which is one of the most important tomato fruit parasites in the West Indies, various species of *Fusarium* and *Phomopsis*, and *Botryoplodia theobromae* causing soft rots; species of *Fusarium* and *Phomopsis* causing a firmer brown rot; *Phoma destructiva*, *Cladosporium fulvum*, and a species of *Guignardia* causing smaller, slow-growing dark lesions; and *Phytophthora infestans* and *P. parasitica*, liable to cause severe damage during wet weather. Most of the soft rotting is attributed to careless handling and to the export of fruits already damaged by

mechanical or insect injury. It was experimentally shown that the rapidly growing soft-rotting fungi can be largely eliminated by selecting unblemished, sound fruit, leaving only the slower-growing species, which develop later and do not damage the commercial shipments to the same extent. The primary infection of the fruit is stated to take place in the field. A type of latent infection [ibid., xvi, p. 395], remaining dormant until the fruit ripens, is occasionally produced by *Colletotrichum gloeosporioides*, *Phomopsis* spp., *Phoma destructiva*, *Cladosporium fulvum*, and *Guignardia* sp. in sound, unripe tomatoes, but the majority of infections are caused by fungi entering the fruit through cuts, bruises, growth cracks, blossom-end rot lesions, and injuries due to sucking insects, such as *Phthia picta*, *Leptoglossus balteatus*, and *Nezara viridula* [ibid., xi, p. 610]. When 50 carefully selected fruits were left to ripen for a fortnight, 21 developed blemishes, mostly small, black spots caused by *Phoma destructiva*, with small holes in the centre apparently made by one of these insects. These spots were invisible when the fruits were green, the infections taking place through the wounds having apparently remained dormant until the fruit reached a stage of maturity favourable for further development. The following suggestions are made for the reduction of wastage: careful cultivation to produce good fruit of correct size and free from cracks and wounds; control of the larger sucking bugs; picking the fruit at the proper stage of maturity; cautious handling during picking, grading, and packing; and the exclusion of all damaged fruits.

Notes are appended on various organisms causing diseases of the tomato in the West Indies, including the following in addition to those listed above: several species of *Alternaria* and *Macrosporium* (including probably *M.* [*A.*] *solani* and *M.* [*A.*] *tomato*) [ibid., xviii, p. 766], *Colletotrichum phomoides*, *C. falcatum* (occurred twice in 1939), *Corticium solani* (not found in 1939 but present on other crops in Trinidad), *Rhizopus* spp. (of little importance), various unidentified species of *Helminthosporium* (of no commercial importance), *F.* [*bulbigenum* var.] *lycopersici*, *Sclerotium rolfsii*, and *Bacterium solanacearum*, any of the three last-named being able to cause serious losses from wilt besides infesting the soil for many years.

Atanasoff (D.). Горска патология. [Forest pathology.]—404 pp., 188 figs., Университетска Библиотека [University Library], 204, Imprimerie de la Cour, Sofia, 1939.

This is a fully documented text-book intended for students of forest pathology. The subject is discussed in six chapters dealing, respectively, with physiological, virus, bacterial, and fungous diseases of trees, parasitic phanerogams, and the preparation of fungicides.

Chorin (M.). **Cytospora chrysosperma on Populus nigra.**—*Palest. J. Bot.*, R Ser., ii, 2, pp. 251–288, 1 fig., 1939.

Cytospora chrysosperma [*R.A.M.*, xviii, p. 642] was observed causing yellowing and defoliation of poplars (*Populus nigra*) at Tel Aviv, Palestine, in April, 1939. The perfect stage of the fungus (*Valsa sordida*) [ibid., x, p. 418] has not developed either in nature or in culture.

Leach (J. G.) & Valleau (W. D.). **Two reports on phloem necrosis of Elm.**—*Plant Dis. Reptr*, xxiii, 18, pp. 300–301, 1939. [Mimeographed.]

J. G. Leach reports that elm trees in the south-west of West Virginia are being rapidly killed off by phloem necrosis [*R.A.M.*, xviii, p. 147]. Known to have been present for several years in the vicinity of Huntingdon, where several thousand elms have succumbed to it, the disease appears to be spreading fast, the number of trees killed by it in any given locality increasing every year. It has been observed as far east as Cedar Grove (about 20 miles east of Charleston) and as far north as Parkersburg. Trees of all ages are susceptible and even the largest may be killed in one season. Potentially, the disease is at least as dangerous as Dutch elm disease [*Ceratostomella ulmi*]. No effective means of control are known. The situation is further complicated by the presence in the western half of West Virginia of *Scolytus multistriatus*, which breeds abundantly in the dead trunks. *C. ulmi* itself is present in Athens county, Ohio, within 20 miles of Parkersburg.

W. D. Valleau states that elm phloem necrosis has been present near Lexington, Kentucky, for over ten years. It has killed about 50 per cent. of the elms on one estate, where more are still dying, and has killed many elms on others. Only transplanted trees, 5 to 15 years after transplanting, seem to be affected. All the dying trees are stated to have originated outside Kentucky, the native trees (some of which are 75 to 100 years old) on the estates in question being unaffected.

Peace (T. R.). **The resistance of Elms to the disease caused by Ophiostoma (Ceratostomella) ulmi.**—*Leafl. Imp. For. Inst.* 2, 4 pp., 1939. [Mimeographed.]

Evidence obtained in England failed to show that *Ulmus vegeta* possesses more resistance to *Ceratostomella ulmi* [*R.A.M.*, xix, p. 124] than the varieties commonly grown, while small-scale tests indicated that *U. montana fastigiata* was susceptible and that *U. montana fastigiata aurea* (*wredei*), a tree that makes somewhat poor growth, possesses some resistance. The Jersey elm (*U. stricta wheatleyi*), owing to its upright growth, is well suited for street planting, but frequently becomes infected. As a rule, the damage is not very severe, appearing chiefly as a die-back of the twigs, which seriously reduces the growth rate, but does not kill the tree as a whole, or its large limbs, and is, therefore, not very disfiguring. The resistant Asiatic species are mostly small and do not grow well in England. The most valuable are *U. pumila* and its var. *pinnato-ramosa*, *U. parvifolia*, and the variety of the last-named known in the south-western United States as *U. sempervirens*. In Great Britain and northern Europe *U. parvifolia* and *U. pumila* grow slowly and suffer from winter die-back and infection by *Nectria* [cf. ibid., xvii, p. 142; xviii, p. 354]. The best of the Dutch sections and the only elm selected for resistance that has been generally distributed as yet is *U.* Christine Buisman. It somewhat resembles *U. wheatleyi*, but its habit is much less upright. Attention is drawn to the fact that resistant elm varieties grafted on *U. montana* may suffer severe damage if the fungus reaches the stock; in Holland *U.* Christine Buisman has been widely propagated on susceptible stocks, a practice

which should not be followed in England. This variety, and trees such as *U. pumila* and *U. parvifolia*, while resistant to the fungus, are not immune.

In selection and breeding work in England no really resistant seedling of *U. montana* has been found, and one uniform planting of *U. americana* has failed to yield any promising trees. A number of quite resistant individuals have, however, been selected from a batch of plants raised from seed collected in central Europe and sold as *U. campestris*. These trees appear to be hybrids. In the summer of 1938, a number of healthy elms in the areas worst affected in Great Britain were heavily inoculated experimentally, and with one exception no appreciable damage resulted. Propagation from these trees is now progressing, but the progeny will require further testing.

Ark (P. A.). **Bacterial leaf spot of Maple.**—*Phytopathology*, xxix, 11, pp. 968–970, 1 fig., 1939.

A disease of maple (*Acer macrophyllum*), characterized by a profuse dark brown or black spotting of the leaves, accompanied in severe cases by petiole and bracket cankers, has recently been observed in California. It is similar to the disorder of *A. trifidum* and other species described by Ogawa from Japan as due to *Phytomonas* [*Pseudomonas*] *acernea* [*R.A.M.*, xvii, p. 358], but the causal organism of the present disturbance, a uni- or biflagellate bacterium, was found to differ on beet extract-peptone agar cultures in various respects, including its larger dimensions (0·8 to 2·5 by 0·3 to 0·8 μ), temperature relations (optimum 13° to 31° C.), capacity to reduce nitrates and to form hydrogen sulphide in lead acetate agar, and its greyish-white colonies with slight fluorescence in the medium: it is accordingly named *Phytomonas aceris* n.sp. Inoculation experiments with a suspension of the pathogen on *A. circinatum*, *A. negundo* and its var. *californicum*, and *A. palmatum* gave positive results under humid conditions.

Hedgcock (G. G.). **Notes on North American Pine-Oak species of Cronartium on Castanea, Castanopsis, and Lithocarpus.**—*Phytopathology*, xxix, 11, pp. 998–1000, 1939.

A tabulated account is given of the writer's inoculation experiments, carried out with the aid of R. N. Hunt and G. G. Hahn at the Bureau of Plant Industry, Washington, D.C., at various times between 1909 and 1930, with *Cronartium cerebrum* [*R.A.M.*, xvii, p. 359], *C. conigenum* [ibid., xiii, p. 738], *C. fusiforme*, *C. strobilinum* [ibid., ii, p. 3], and an unidentified *Cronartium* from evergreen oaks on eight species of *Castanea*, five of *Castanopsis*, and *Lithocarpus densiflora*. The *Cronartium* species under observation were found to differ not only in the dimensions of their fruiting and spore forms, but also in their effects on plants inoculated under comparable greenhouse conditions.

Roldan (E. F.). **Damping-off of seedlings in forest nursery.**—*Philipp. J. For.*, ii, 3, pp. 225–233, 1 pl., 5 figs., 1939.

According to an unpublished report by T. Delizo (Division of Forest Investigation, Los Baños, Laguna, 1933), seedlings of the following

broad-leaved trees are susceptible to damping-off in the Philippines: *Adenanthera microsperma*, *Elaeodendron anfractuosum*, *Cedrela mexicana* (which suffers almost as severely as conifers), *Aleurites moluccana*, *Cinchona* sp., and *Carludovica palmata*. In the writer's studies on forest tree seedlings (including pine and the Panama hat palm [*C. palmata*]), *Pythium* (chiefly *P. ultimum*) [*R.A.M.*, x, p. 569] developed in about 60 per cent. of 250 isolations, *Rhizoctonia* in 23 per cent., and *Fusarium* in 17 per cent. A brief account is given of the life-history of the fungi and their mode of infection, with directions for control by soil treatment with sulphuric acid (1 in 160, 1 l. per sq. ft. or 1 in 80, 500 c.c. per sq. ft. in wet soils) or formalin (1 in 100, 4 l. per sq. ft. or 1 in 50 in wet soils, same rate of application), the site to be left for 12 to 14 days before planting.

Yolores (B. Y.). **Extent of defects of some Dipterocarp species in northern, central, and south-eastern Luzon.**—*Philipp. J. For.*, ii, 2, pp. 185–199, 1939.

Fungi of the *Fomes* group, including *F. applanatus* [*Ganoderma applanatum*] and *G. lucidum*, have been found responsible for various defects, the incidence of which ranges from 5 to 31 per cent., in merchantable timber of *Dipterocarpus grandiflorus*, *Shorea palosapis*, *Anisoptera thurifera*, *S. polysperma*, and *Pentacme* [*S.*] *contorta* in the Philippines.

Reichert (I.) & Avizohar (Zehara). **An anatomical study of the fruit-body of the wood-rotting fungus Ganoderma lucidum (Leys.) Karst. in Palestine.**—*Palest. J. Bot.*, R Ser., ii, 2, pp. 251–288, 4 pl., 1 fig., 1939.

This is a detailed account of the authors' intensive anatomical studies on the fruit bodies of *Ganoderma lucidum* [*R.A.M.*, xv, p. 684 and preceding abstract], the agent of severe damage to various trees, including fruit trees, in Palestine. The fungus often occurs only in its mycelial stage, when it is difficult to differentiate it from other indigenous wood-rotting fungi, notably *G. applanatum*.

Five distinct hyphal systems were found to be involved in the construction of the fruit bodies from seven hosts of the fungus, namely, almond, plum [ibid., xii, p. 9], *Ceratonia siliqua*, *Eucalyptus* sp., mulberry (*Morus alba*), olive, and orange budded on sweet lime: these are the skeletal, constituting the somatic portion of the fruit body and the dissepiments; the generative, giving rise to the crust and hymenium; the binding, serving to strengthen and consolidate the texture of the organ; the palisade, forming an external protective layer; and the plectenchymatic, closely uniting and compacting the tissues. The skeletal system is believed to be self-contained, developing zone by zone from the primordium onwards, each zone being formed from the plasmatic parts of the skeletal hyphae of the preceding zone. The white strands permeating the fructifications were found to contain pale hyphae which exert a cytolytic action on the tissues they traverse and so induce the formation of cavities occupied by internal spores, or gasterospores, first described by S. R. Bose (*Mycologia*, xxv, pp. 231–234) for this fungus.

Ramirez (I.). **Schizophyllum commune Fr.—a forest products-rotting fungus.**—*Philipp. J. For.*, ii, 2, pp. 121–143, 2 pl. (1 col.), 1939.

Full particulars are given of the writer's studies in 1937–8 in the northern portion of Makiling National Park, Laguna Province, Philippine Islands, on the host range of *Schizophyllum commune* [*R.A.M.*, xviii, p. 490], the factors favouring and inhibiting its development, the effect of the fungus on its hosts, and control methods.

The mycelium of the organism was found to vary according to the host, being pinkish-white on the bark of *Swietenia mahagoni* and appearing as a white, cottony weft on the surface of sapwood or any white wood. In light-coloured wood the affected parts are pale tan or pale grey, darkening as the rot advances. Sometimes the decay occurs in zones, of which the innermost is light brown or tan, the second pale grey, and the third very dark grey to black. Badly decayed wood is so soft that it crumbles on pressure.

Inoculation experiments with the fungus are described. Positive results were obtained on fresh samples of *Celtis philippinensis* and *Leucaena glauca*, oven-dried *Parashorea* [*Shorea*] *plicata*, and kiln-dried rattan (*Calamus* spp.). Within blocks of *Aleurites trisperma* [*A. moluccana*] measuring 5·4 by 2 by 1 or 2 by 1 by 1 in. the fungus is able to develop in the presence of a moisture content above 18 per cent., and did not succumb to 16 days' exposure to a temperature of 46° C. or 48 hours at 100° in the presence of sufficient moisture, but no revival took place among the blocks kept in an oven for 96 hours at 100°. Six pieces of *A. moluccana*, two 4·4 by 2 by 1 and four 2 by 1 by 1 in., attacked for 72 days by *Schizophyllum commune* lost 7 per cent. of their oven-dry weight. In painted wood infection takes place through fissures or other apertures; an inspection of the coal tar-treated electric light and telephone posts in the Park revealed the fungus in 20 out of 34 (58 per cent.), replacement being necessary in some cases after four years' service. On living trees the fungus enters through wounds on dead branches. The fruiting bodies require plenty of oxygen for normal development.

The most effective means of control is the utilization of all severely infected material for firewood. Storage of all susceptible species in places where the moisture content can be maintained at or below the critical point of 18 per cent. is also important, while there is some prospect of the biological elimination of the fungus by an insect belonging to the Pyralidae, further studies on which are necessary, however, before making any recommendations for its general use.

Garcia (L. A. A.). **A Mahogany seedling blight in Puerto Rico.**—*Caribb. Forester*, i, 1, pp. 23–24, 1939. [Spanish summary. Mimeographed.]

Attention is drawn to a destructive outbreak of disease in August, 1939, among six-months-old seedlings of the valuable West Indian mahogany (*Swietenia mahagoni*) in the Insular Forest Nursery, Guanica, Puerto Rico. The first perceptible symptom is the development of a discoloured area along the leaf margins, especially the apical portions, which present a necrotic appearance; the dingy yellow to dark brown areas gradually extend towards the petiole and the diseased leaves

finally drop. The causal organism was identified as a hitherto undescribed species of *Phyllosticta*, *P. swietenia* n.sp. [with a diagnosis in English only], characterized by numerous amphigenous, ochreous, lenticular to globose, erumpent pycnidia, scattered over the necrotic parts of the leaf, 190 to 285 by 95 to 135 μ in diameter, furnished with a distinct, black-bordered ostiole, 20 μ in diameter; and hyaline, granular, ellipsoidal conidia, 5·7 to 7·6 by 2·8 to 3·8 μ. Infection is favoured by excessive moisture and dense shading, which induce optimal environmental conditions for conidial germination.

Swanson (H. E.). **Blister rust control in the Inland Empire.**—*J. For.*, xxxvii, 11, pp. 849–852, 1939.

White pine blister rust [*Cronartium ribicola*], accidentally introduced into British Colombia about 1910 and discovered in Vancouver in 1921, is stated to have spread to five western States of the American Union, namely, Washington, Idaho, Oregon, Montana, and California [*R.A.M.*, xv, p. 336; xviii, pp. 216, 562]. The first infected white pines were observed in the Inland Empire in 1927, though the disease appears to have reached the region in 1923. In 1936 about 4 per cent. of the young trees in two sections of northern Idaho were visibly infected, while elsewhere in the area under investigation the incidence of the rust ranged from a fraction of 1 to 1 per cent. In 1937 there was 13 per cent. visible infection on young white pines in the St. Joe (Idaho) National Forest.

Four methods are in use for the elimination of *Ribes* from the 2,710,129 acres of white pine forest deemed to be of sufficient commercial value to justify the cost of protection [cf. ibid., xvii, p. 149], of which hand-pulling or grubbing is the most widely employed, 1,700,851 acres having been covered, and 320,111,677 bushes destroyed, by this means, corresponding to percentages of 94 and 98, respectively. In places where the bushes cannot be readily eradicated for various reasons, they are cut off through or below the crown and the exposed portions of the crown or roots left in the ground are treated with 2 oz. of a dry mixture of borax and sodium chlorate [ibid., xviii, p. 359]. *R. petiolare* in alluvial bottom lands can only be destroyed by spraying with sodium chlorate. Two mechanical methods, the 'bulldozer' tractor [loc. cit.] of caterpillar type and hand-slashing, are necessary for the clearance of the dense concentrations of *R. inerme* which are also supported by alluvial bottom lands.

A survey made in 1934 in northern Idaho showed that on five infected areas, containing 7,701 pines, where *Ribes* eradication was initiated in 1929 and 1931, 13·2 per cent. of the trees were found to be diseased, 12·6 before the work was commenced and only 0·6 afterwards. Of 10,620 trees examined in the Clearwater National Forest (Idaho) in 1938, 368 were found to be infected, 338 before the eradication operations of 1929 to 1933 and only 30 (0·3 per cent.) in subsequent years. Permanent control is considered to have been achieved over some 891,600 areas, or 52 per cent. of the entire area covered, by a single working.

Details are given of the four broad ecological types of land in the Inland Empire destined for *Ribes* eradication, comprising (1) newly

disturbed or denuded areas on which the young conifer stand has only recently started, favouring the appearance and persistence of *Ribes*; (2) coniferous stands of pole and merchantable size with such a light forest density as to permit continued *Ribes* growth; (3) the same, with heavy forest density precluding the occurrence and reproduction of the alternate rust host; and (4) the narrow belt along streams over which the coniferous canopy is broken, allowing of the permanent occurrence of brush and promoting the natural increase of *Ribes*. Working methods will of course be adapted to the requirements of the different types, of which (1) will normally require three workings at three-year intervals, (2) and (3) only one (sometimes two in the former case), and (4) at least three; the last-named type represents only 6 per cent. of the total area involved. To date a single working has sufficed to establish a *Ribes*-free condition on 35 per cent. of type (1) area, 66 per cent. of (2), and 82 per cent. of (3).

It was estimated that, despite the progress made in blister rust control in the Inland Empire, about 850,000 acres of valuable white pine stands (30 per cent. of the eradication area) would remain unprotected at the close of the 1938 season. Lumbering is one of the key industries of the region and western white pine [*Pinus monticola*] the key tree, its value representing 75 per cent. of the value of the forest products consumed within and exported from the Inland Empire. In addition to the large unprotected acreage a substantial reworking programme is necessary, and at present the spread of the blister rust is rapidly outstripping the progress of control operations.

The Swiss leaf-cast disease of Douglas Fir.—*For. Abstr.*, i, 2, pp. 69–71, 1939.

This is a review, based largely on the literature on the subject and on manuscripts in the possession of the Imperial Forestry Institute, of the present state of knowledge concerning the needle-fall disease of Douglas fir [*Pseudotsuga taxifolia*] caused by *Phaeocryptopus gaeumanni* [see next abstract].

Liese [J.]. **The occurrence in the British Isles of the Adelopus disease of Douglas Fir.**—*Quart. J. For.*, xxxiii, 4, pp. 247–252, 3 figs., 1939.

During the spring of 1939, the author paid a five days' visit to Eire, in the course of which he observed Douglas fir trees [*Pseudotsuga taxifolia*] attacked by needle fall (*Adelopus*) [*Phaeocryptopus gaeumanni*: *R.A.M.*, xviii, p. 827] at Rathdrum, Camolin, Aughrim, Glencree, Emo Park, Ravensdale Property (near Dundalk), near Bray, and in Powerscourt gardens and their vicinity. Every stand seen was badly attacked; in a few localities particular strains were so severely diseased as to raise grave doubts as to the future development of the stands. The disease was first observed in Eire in 1928, but had probably been active before then. In no case, however, had any tree been killed, perhaps because the plantations are established on grassland, where the honey fungus [*Armillaria mellea*] has obtained no hold, whereas in South Germany trees weakened by *P. gaeumanni* are readily attacked by *A. mellea*. On trees over 30 years of age the damage caused was negligible. In experimental plots of 15-year-old trees near Dundalk raised from seed from

Shuswap, Vancouver Island, and Louis Creek, the same amount of infection was apparent in each, but only a moderate amount of damage was caused in the first two whereas the third was considerably damaged. These differences in degree of attack are attributed to different degrees of susceptibility in the various races of Douglas fir. On account of the disease, the Eire Forestry Department has greatly restricted the use of this species.

Rhabdocline [*pseudotsugae*: loc. cit.] was observed on one plot of Colorado Douglas fir, a slow-growing mountain form.

Gerlings (J. H. J.). **Herkomstonderzoek van den Douglasspar aan de afdeeling houtteelt van het Instituut voor Boschbouwkundig Onderzoek.** [Analysis of origin of the Douglas Fir at the silvicultural section of the Forestry Research Institute.]—*Ned. Boschb.-Tijdschr.*, xii, 10, pp. 405–432, 1 graph, 1 map, 1939.

In connexion with an intensive analytical study on the influence of the place of origin on the subsequent development of Douglas firs (*Pseudotsuga douglasii* or *P. glauca*) [*P. taxifolia*] in Holland, the writer mentions that the *viridis* forms are immune from attack by *Rhabdocline pseudotsugae* [see preceding abstract], the *caesia* slightly, and the *glauca* highly susceptible [*R.A.M.*, xviii, p. 3]. From 1937 to 1939 the fungus was more prevalent in the north-east of the country than in the central districts and least in evidence in the south. A similar distribution was observed in the case of *Lophodermium pinastri* on pines. The *glauca* and *caesia* forms of *P. taxifolia* suffer little damage from *Phomopsis pseudotsugae* [ibid., xiv, p. 264; xviii, p. 490] which occurs more or less severely, however, on *viridis*.

Zerova (Mme M. Y.). Хвороба Ялини, викликана грибом **Phomopsis piceae sp.n.** [A disease of Spruce caused by the fungus *Phomopsis piceae* n.sp.]—*J. Inst. Bot. Acad. Sci. Ukraine, 1939*, 20 (28), pp. 137–143, 6 figs., 1939. [English summary.]

During 1936–7, a die-back of five- to eight-year old spruce (*Picea excelsa*) trees was observed in a nursery near Kieff, preceded by a yellowing and dropping of the needles and a shrivelling of the branches. No fungus fructifications were found on the surface of the trees, but mycelium pervaded the inner bark and wood from the root base upwards; isolations in culture constantly yielded an undescribed species of *Phomopsis*, which is named *P. piceae* [with a Latin diagnosis]. Other fungi present were *Pestalozzia hartigii* [*R.A.M.*, xvii, p. 84], *Fusarium* sp., and *Alternaria* sp., but *Phomopsis piceae* is believed to be the causal agent, although preliminary inoculation experiments gave negative results.

The fungus developed pycnidia on beer wort agar and Raulin's medium; they were black, uni-, bi- or trilocular, with a round ostiole, at first slightly flattened, with a broad base, 0·4 to 1·3 by 0·2 to 0·7 mm., but later large, cylindrical, 1 to 2 by 5 to 6 mm.; the conidiophores were indistinct and the α spores were oblong-oval, biguttulate, 5 to 9 (rarely 9·5) by 1·8 to 2·3 μ and the β spores filiform, curved, sometimes straight, 18 to 24 by 1 to 1·5 μ.

Davis (W. C.) & Latham (D. H.). **Cedar blight on wilding and forest tree nursery stock.**—*Phytopathology*, xxix, 11, pp. 991–992, 1939.

Phomopsis juniperovora [*R.A.M.*, xviii, p. 444] was isolated in 1937 and 1938 on 3- to 20-year-old natural reproduction of red cedars (*Juniperus virginiana*) in North Carolina and on the same host (2 to 8 years old) in Tennessee; in 1938 the fungus was also isolated from red cedar nursery stock in the same two States, Virginia, and Iowa. Attempts to combat the disease by means of fertilizing with ammonium sulphate or a 4–10–4 fertilizer were definitely unsuccessful, the losses caused by the disease being about twice as great as on unfertilized plots. The costs of drastic roguing and spraying with Bordeaux mixture would probably be disproportionately high in relation to the results achieved.

Goidànich (G.). **Il cancro del Larice prodotto la Dasyscypha willkommii.** [Larch canker produced by *Dasyscypha willkommii*.]—*Riv. for. ital.*, i, 9, pp. 30–35, 8 figs., 1939.

In this account (based largely on the literature of the subject) of larch canker (*Dasyscypha willkommii*) [*R.A.M.*, xviii, p. 74] the author states that the disease was first recorded in Italy in 1800, but that it does not seem to have caused much damage locally, and not much attention has been paid to it. In view, however, of the commercial importance of forests to Italy to-day, every care should be taken to see that the disease does not spread. In one infected area (near Vetviolo, in the Val Sugana, altitude 1,600 m.) observed by the author in 1939, where reafforestation appeared to have been carried out, many trees three to four years old were severely infected, and the condition of the older, diseased trees showed clearly that the attack had taken place during the first few years after planting. Some of the trees had died or were badly wilted, and even those less severely affected would produce inferior timber.

The author recommends that all trees showing even the first symptoms of the disease should be removed wherever they are found, especially in new plantings. The lower branches, particularly if they have died, should be cut off and burnt. Finally, larch trees should never be planted in unsuitable localities, and wherever possible they should be mixed with broad-leaved varieties.

Day (W. R.). **The diseases of the Larch.**—Abs. in *Rep. Brit. Ass.* (New quart. Ser. 1), p. 114, 1939.

The author expresses the view that physical and biotic factors are responsible for disease in European larch in Britain. Failures of the tree have been due probably to lack of appreciation of the fundamental requirements of the tree or of the physical character of the habitat into which it has been introduced [*R.A.M.*, xvii, p. 360]. Fungus parasites and insect pests are of secondary importance, as is also silvicultural treatment, though this may be an important factor predisposing to disease.

A handbook of home-grown timbers. —vi+87 pp., London, H.M. Stationery Office, 1939. 2*s.*

A handbook of Empire timbers.—vii+214 pp., London, H.M. Stationery Office, 1939. 3*s.* 6*d.*

Both these volumes are planned on the same lines, the first dealing with 26 hardwoods and 9 softwoods, and the second with 79 hardwoods and 17 softwoods. After a general introduction, separate sections are devoted to each species, containing a description of the tree and its timber, together with notes on the durability and other properties of the latter, including (where such information is available) its resistance to attack by wood-destroying fungi and its permeability to preservatives.

Findlay (W. P. K.) & Pettifor (C. B.). **The effect of sap-stain on the properties of timber. III The effect of sap-stain on the modulus of elasticity of Scots Pine sapwood.**—*Forestry*, xiii, 2, pp. 146-147. 1939.

In further tests on the effect on the strength of Scots pine sapwood of staining due to *Ceratostomella coerulea* [*R.A.M.*, xviii, p. 829], the modulus of elasticity (1,000 lb. per sq. in.) was reduced from 1,430 before staining to 1,420 when the amount of staining was none or slight (58 results) and from 1,450 before staining to 1,410 when staining was moderate to heavy (25 results). These reductions amount, respectively, to 0·7 and 2·8 per cent., of which only the latter is significant. From a practical point of view, however, the decrease, even in the more heavily stained timber, may safely be neglected.

Carswell (T. S.) & Hatfield (I.). **Pentachlorophenol for wood preservation.**—*Industr. Engng Chem.*, xxxi, 11, pp. 1431–1435, 3 figs., 1939.

This is a summary of the researches to date by the writers and others in the United States on the use of pentachlorophenol as a timber preservative [*R.A.M.*, xviii, p. 5], demonstrating the exceptional value of the chemical for the treatment of millwork.

Foulon (A.). **Holzimprägnierung.** [Wood impregnation.]—*Z. Papier* (formerly *Zbl. PapIndustr.*), lvii, 21–22, pp. 277–279, 1939.

An account is given of recent developments in timber-preservation methods in Germany. The saving of coal tar oil by the use of the economical Rueping process [*R.A.M.*, xix, p. 58], as compared with the full-pressure system, is estimated at one-quarter. Of late years coal tar has been largely replaced by the Wolman salts, especially in mines, where timber treated by the former substance is unsuitable by reason of its inflammability and detrimental effects on health. Moreover, some 60 per cent. of the commercial coal tar oil constituents are needed for motor transport. A method has therefore been devised of combining the remaining 40 per cent. (the viscous fractions) with Wolman salts [see above, p. 129] in such a way as to ensure double and first-class protection of the wood.

The arsenic, hydrofluoric, and fluosilicic acid colour bases possess

an insufficient penetrative capacity unless combined with non-aqueous solvents, such as coal tar, phenols, and alcohols, whereby excellent results are obtained. Another effective preservative consists of an aqueous solution of the silicic acid esters of phenols, e.g., $Si(OC_6H_5)_4$. Other efficient solvents for wood preservatives include organic halogen compounds, which themselves exert a strong protective action. Trivalent arsenic compounds have been found more efficacious than the quinquevalent for timber impregnation. Copper and zinc are resistant to lixiviation and lend themselves to combination with arsenic, while a further improvement is embodied in a new patent (DRP 636,873) by R. Falck involving the use of cold neutral aqueous arsenic trisulphide solutions in colloidal form.

Wicht (H.) & Schulze (B.). **Untersuchungen über das Osmose-Holzschutzverfahren unter Benutzung des Scheibenverfahrens.** [Investigations on the method of timber protection by osmosis using the disk technique.]—*Holz Roh- u. Werkstoff*, ii, 11, pp. 384–386, 3 figs., 1939.

A fully detailed account is given of the writers' investigations at the Timber Biology Institute, Dahlem, Berlin, on the applicability of the osmosis technique of timber preservation [*R.A.M.*, xix, p. 58] to pine, spruce, and beech wood, with special reference to penetrability under varying conditions. The protectives were applied to decorticated green wood blocks in paste form at rates between 300 and 800 gm. per sq. m. and left for ten days. During this period the dinitrophenol component of the preservative penetrated the wood to a depth of 12 mm. or more and the fluoride salts upwards of 40 mm., the course of the latter being followed by means of a yellow-staining zircon-alizarin reagent supplied by the I. G. Farbenindustrie. Both heart and sapwood were permeated to a very considerable extent in a relatively brief period. Results of this order were obtained, for instance, with the soluble osmol UA (one part plus six of water), with the addition of a special colloidal substance, recently put on the market, at the rate of 5 to 6 per cent. by weight, on green, spring-felled pine wood at 20° C. The omission of the colloid reduced the extent of penetration by about half. At a temperature of 40° the treatments were generally less effective, though even under these conditions satisfactory penetration of both components was secured in some instances. The efficacy of the osmosis method of timber preservation against wood-destroying fungi and insects is considered, however, still to require further trials.

Kalniņs (A.) & Liepiņs (R.). **Technical properties of Latvian coniferous timber (Pinus silvestris L., Picea excelsa Lk. and Larix europaea DC.) with relation to conditions of growth.**—*Rep. Latvian For. Res. Sta.*, x, 85 pp., 12 figs., 1 diag., 13 graphs, 3 maps (1 col.), 1938. [Latvian summary. Received September, 1939.]

This paper contains information on the methods which are being tested in Latvia for the prevention of wood rots and blueing (*Ceratostomella pilifera*) [*R.A.M.*, xvi, pp. 358, 787] in pine (*Pinus sylvestris*), spruce (*Picea excelsa*) [*P. abies*], and larch (*Larix europea*). A recent

development in this direction consists in the artificial increase of the natural resin content. In the case of pine, the bark is removed above the part of the trunk most liable to attack one summer, or preferably several, before felling and the area systematically enlarged until almost the whole of the sapwood below the initial site of decortication becomes saturated with resin, the content of which may be raised from 2 per cent. in the sapwood and 4 to 10 in the heartwood to an average of 15 to 16 per cent. *Lentinus squamosus* [*L. lepideus*] is the only fungus liable to infect wood thus treated. Incisions in the tree should be made at six- to seven-day intervals from May to August, the bark being peeled off in vertical strips during the first summer and in horizontal ones, 3 to 25 cm. in width, in succeeding years, leaving one uncut strip, 5 to 8 cm. wide, between the intact parts above and below the injured portion. The preservation of one normal-sized telegraph or telephone pole by this means costs only about 3*d*.

Spruce wood, with its very low resin content (0·7 to 1 per cent.), is particularly liable to fungal invasion. The increase of resin, carried out as directed for pine, is stimulated by the application to the decorticated surface of 60 per cent. sulphuric acid, 20 per cent. potassium hydroxide, or 3 per cent. carbolic acid, and covering for 10 to 14 days with moss or the peeled-off bark to prevent too rapid drying. The cost of preservation of a spruce pole is 3d. to 7d. according to the method employed. For the prevention of blueing phenol derivatives, mercuric chloride, or sodium fluoride are recommended.

Where impregnation has to be carried out on unprepared poles the osmosis technique [see preceding abstract] should be adopted, using 10 kg. of preservative salts, e.g., osmolit UA, per 6 to 10 l. water, plus 5 per cent. of an adhesive, such as starch paste, molasses, waste cellulose, or glycerine. After treatment the poles, in triangular piles, are covered with waterproof oiled paper, conifer branches and sphagnum, or peat and half-rotten straw, and left for two to three months, during which period the salts sink deeply into the wood (dinitrophenol 10 to 20 mm., mercuric chloride 20 to 30 mm., instead of only 2 to 5 mm. by ordinary immersion), half the final depth of penetration usually being reached in the course of the first week. The extent of penetration is generally about 20 per cent. less in spruce than in pine except in the case of mercuric chloride and copper sulphate. Osmosis can be carried out equally well in summer or winter.

The calorific capacity of blue-stained spruce wood was found to be reduced by about 1 per cent. in comparison with that of normal specimens.

Lynch (P. R.). **Brown heart in Swedes. Minimum application of 15 lb. borax per acre will usually give satisfactory results.**—*N.Z.J. Agric.*, lix, 4, pp. 319, 320, 2 figs., 1939.

The results of field trials on the control of brown heart of swedes [*R.A.M.*, xviii, p. 565] conducted in various localities in New Zealand during the 1937–8 season showed that excellent control of the disease was obtained in nine experiments with applications of borax broadcast after sowing, a minimum quantity of 15 lb. per acre being usually sufficient to give satisfactory results. In three experiments, however, only

fair control was obtained and in two localities the treatment was inexplicably ineffective.

Van Schreven (D. A.). **Symptômes peu connus du manque de bore chez les Betteraves sucrières, présages de la pourriture du cœur proprement dite.** [Little known symptoms of boron deficiency in Sugar Beets, precursors of heart rot proper.]—*Publ. Inst. belge Amélior. Better.*, vii, 4, p. 329, 1939.

From 1936 to 1938, inclusive, especially during August, September, and October, sugar and fodder beets [? in Holland] were observed to show local swellings of the midrib and lateral veins, sometimes accompanied by longitudinal fissures. In certain instances only one leaf or a few of the outer ones were affected, the remainder of the plant appearing quite normal. This symptom, designated 'vein rot', is attributed to a transitory boron deficiency, which may well develop into heart rot proper unless arrested by timely soil treatments [see next abstract].

Decoux (L.) & Roland (G.). **La pourriture du cœur de la Betterave en Belgique, les signes précurseurs, les dégâts causés par la maladie et les moyens de lutte.** [Beet heart rot in Belgium, the precursory symptoms, the damage caused by the disease, and the means of control.]—*Publ. Inst. belge Amélior. Better.*, vii, 4, pp. 335–338, 1939. [Dutch translation on pp. 338–340.]

On 17th June, 1939, the writers observed in certain beet fields, notably in the Mielen-sur-Aalst district of Belgium, a curling of the leaves, especially the outer ones, and a swelling, blackening, and abrupt outward curving of the midribs and sometimes also of the secondary veins: these symptoms have been described by van Schreven [see preceding abstract] as precursors of heart rot [*R.A.M.*, xviii, p. 79 and above, p. 132], and should be a signal for the immediate application of boron, particularly on alkaline soils in dry seasons. Statistical calculations have shown that the disease may reduce the sugar content of the roots by 30 per cent., besides impairing its purity, the adverse effects being more pronounced in varieties with poorly developed leaves than in those with luxuriant foliage, which incidentally may be entirely destroyed in severe cases. Preventive treatments of boron should be given in the form of borax (10 to 20 kg. per hect.) or boric acid (7 to 14), while remedial applications (where the first premonitory signs have appeared as reported above) should consist in a top-dressing of boron mixed with sand or spraying at the rate of 10 to 20 kg. borax in 1,000 l. water per hect. Observations have shown that heart rot is more troublesome in sparsely planted fields, particularly in the case of scanty-leaved varieties, the average incidence among which is 21 per cent. compared with 16 for those with abundant foliage.

Stirrup (H. H.). **Root rots of Sugar Beet.**—*Brit. Sug. Beet Rev.*, xiii, 8, p. 218, 1 fig., 1939.

Post-lifting root rots of beet, though of rare occurrence in England, may on occasion be responsible for heavy damage, as for instance at the end of the 1934 season in Lincolnshire, when a disease closely resembling that known as 'tail rot' on the Continent caused a loss of

40 to 50 tons in one field and a reduction in the sugar content even of mildly infected roots from 17 to 12 per cent. A large, rod-shaped bacterium isolated from the diseased roots gave negative results in inoculation tests on healthy beets, but produced discoloration and rotting of steam-sterilized slices, accompanied by the exudation of beads of slime similar to those observed on affected roots in the field. The organism, therefore, probably accelerates decay of which it is not the primary agent. Diseased roots left lying in or near the field soon became covered with a crust composed of numerous fungi, the commonest of which was a *Fusarium* inducing a pink discoloration of the substratum but not definitely established as the original cause of the disease. Infection is probably soil-borne.

Krüger (H.). **Sclerotium rolfsii Saccardo an der Zuckerrübe.** [*Sclerotium rolfsii* Saccardo on Sugar Beet.]—*Kühn-Arch.*, xlviii, pp. 233–281, 4 pl., 9 figs., 1939.

A comprehensive, fully tabulated account is given of the author's cultural, morphological, and pathological studies at the Halle Agricultural and Plant Breeding Institute on *Sclerotium rolfsii* from sugar beet [*R.A.M.*, xviii, p. 76]. The material studied comprised a strain of the fungus reported to be causing losses of up to 60 per cent. of the yield near Seville, Spain, *Corticium rolfsii* (Sacc.) Curzi [ibid., xiv, p. 196] from the Centraalbureau voor Schimmelcultures, Baarn, Holland, two strains of *S. rolfsii* from sugar beet in California (J. B. Kendrick), two from Roumi and Belau chillies in Egypt, and one from an unspecified source from New South Wales. There were no morphological or cultural differences between any of the strains, but evidences of antagonism were observed when certain strains were cultured on the same dish [ibid., vi, p. 56].

Sugar beets (Kleinwanzleben E), mangolds, and red beets inoculated with the various strains contracted typical wilt symptoms and collapsed in a few days with signs of extensive decay. *Beta maritima*, *B. trigyna*, *B. procumbens*, *B. patellaris*, and various other Chenopodiaceae were also attacked. The progress of the fungus in the host tissues is at first inter- and subsequently intracellular, and its destructive action was found to involve two distinct processes, a lytic and a toxic, of which only the former, consisting of two main components, is discussed at length in this paper. The mycelium secretes oxalic acid, the function of which, contrary to accepted opinion, is claimed to be lytic rather than toxic, inasmuch as it combines with the calcium of the cell walls to form an oxalate, and stimulates the development of pectinase. *S. rolfsii* also elaborates cellulase, which in comparative tests hydrolysed beet cellulose more rapidly than that of paper. The fungus proved incapable of penetrating a collodion membrane. The hyphae pass from one cell to another by constriction of the hyphal tip. Here again, however, evidences of lytic action were not wanting, and it is probable that the hyphal mechanism is purely contributory.

Of the various sources of nitrogen added at the rate of 0·5 per cent. to cultures of the Spanish strain of *S. rolfsii* on a synthetic nitrogen-free medium only the nitrates of potassium, calcium, and ammonium promoted sclerotial growth, which was virtually suppressed by asparagin

and urea; these substances, and eventually also the slowly acting glycocol, stimulated mycelial development. Added at the rate of 5 per cent. to a synthetic medium pectin induced abundant formation of medium-sized, spherical sclerotia (800 to 900 per dish) resembling those observed on the host; cellulose acted similarly, though the sclerotia were much smaller, while xylan and mannite (10 per cent.) gave rise to bodies of abnormal shape, and soluble starch inhibited the development of the resting stage. The mycelium of germinating sclerotia was killed by 12 hours' exposure to a temperature of —2° to — 5° C., but a fresh one was produced by the same sclerotia on transference to optimum conditions at 28° to 32°, with an atmospheric humidity of 80 to 90 per cent. The minimum temperature for the growth of all the strains was 8° to 9° and the maximum 38° (40° in the case of the Spanish strain).

ROLAND (G.). **Étude des maladies à virus de la Betterave et de l'Épinard effectuée en 1938.** [A study of the virus diseases of Beet and Spinach carried out in 1938.]—*Publ. Inst. belge Amélior. Better.*, vii, 2, pp. 67–96, 6 figs., 1939. [Dutch, English, and German summaries.]

In further studies at Wageningen, Holland, in 1938, on the virus diseases of beet and spinach [*R.A.M.*, xviii, p. 429], the writer ascertained by greenhouse experiments that the symptoms of beet virus yellows [see next abstracts] are more pronounced and typical at 17° than at 30° C. The disease was less in evidence among plants grown at a high soil temperature (25°) than at 12°, probably owing to the stronger foliar development of the former. Nitrogen was again shown to mask the symptoms of yellows. Under the conditions of these tests atmospheric humidity exerted no marked influence on the course of the disease. In addition to spinach, *Chenopodium album*, *C. purpureum*, *Beta cicla viridis*, *Amaranthus retroflexus*, *Atriplex hortensis*, and *A. sibirica* have been found to act as hosts of the virus. A sojourn of half an hour on a healthy beet was found to suffice for the production of infection by *Myzus persicae*, which absorbs the virus from a diseased leaf in an hour. The repeated treatment of infected seed crops with nicotine failed to prevent the spread of yellows to adjacent beet stands. There was no difference under greenhouse conditions in the susceptibility to yellows of beets sown on 20th February and 20th March. Differences in varietal reaction to the disease were also not apparent under glass, though *B. maritima* in the field sustained relatively little damage. Starch was shown to be formed less rapidly in diseased than in healthy foliage, the higher starch content of diseased leaves being due to its accumulation and not to a greater photosynthetic activity [ibid., xv, p. 417]. The symptoms of virus yellows developed sooner and were more severe on beets grown in a humus-sand mixture than in pure humus. The general appearance of the half-sugar Giant Red Claudia suffering from yellows is red rather than yellow.

A further symptom of the 'black wood vessel' (*Pythium*) disease of beets, in addition to the features already enumerated by Quanjer [ibid., xiv, p. 209] serving to distinguish it from virus yellows, consists in the negative reaction to Sachs's stain for starch of the interveinal leaf tissues.

Winter spinach in the Maastricht and Hague districts is affected by virus yellows and by another virus of the mosaic type, apparently identical with cucumber virus 1 [ibid., xvi, p. 680], judging by its symptoms on its own hosts, beet, cucumber, tobacco, and *Nicotiana glutinosa*, and temperature relations.

DECOUX (L.) & ROLAND (G.). **Aire de dispersion de la jaunisse de la Betterave dans les différents pays betteraviers en 1938.** [The range of distribution of Beet yellows in the several Beet-growing countries in 1938.]—*Publ. Inst. belge Amélior. Better.*, vii, 2, pp. 61–66, 1939. [Dutch, German, and English summaries.]

From the replies to a questionnaire issued at the instance of the eighth meeting in January, 1938, of the International Institute of Beet Researches, it appears that virus yellows [see preceding and next abstracts] occurred during 1938 in Belgium, Spain, France, Holland, England [cf. *R.A.M.*, xviii, p. 226], Germany, Denmark, Luxemburg, Sweden, and probably the United States, causing the heaviest damage in the first five of the countries listed.

ROLAND (G.). **Contribution à l'étude des maladies des taches noires de la Betterave.** [A contribution to the study of the black spot diseases of the Beetroot.]—*Publ. Inst. belge Amélior. Better.*, vii, 3, pp. 171–178, 2 figs., 1939. [Dutch, German, and English summaries.]

Previous experiments and observations showed that *Alternaria* sp. can only induce leaf scorch (black spotting) of beet leaves in Belgium [*R.A.M.*, xvi, p. 649] and elsewhere in plants weakened by virus yellows [see preceding and next abstracts] or magnesium deficiency. In the tests at Wageningen, Holland, here described *Phoma betae* [ibid., xviii, p. 79] was found to be a much more virulent parasite, capable of producing typical brown patches on the green leaves of healthy plants. Black spot disease thus assumes two forms, the primary due to direct infection by *P. betae*, and the much more common secondary associated with *A.* sp.

DECOUX (L.) & SIMON (M.). **La jaunisse de la Betterave et les propriétés physiques du sol.** [Beet virus yellows and the physical properties of the soil.]—*Publ. Inst. belge Amélior. Better.*, vii, 4, pp. 223–237, 1939. [Dutch, German, and English summaries.]

A tabulated account is given of recent pedological studies on soil samples from the principal Belgian beet-growing districts, viz., Hesbaye, Hainault, Flanders, and Brabant, the analytical data from which revealed no correlation between the physical properties of the soils in question and the incidence of virus yellows [see preceding and next abstracts].

DECOUX (L.)., VANDERWAEREN (J.), & ROLAND (G.). **La végétation de la Betterave en Belgique au cours de l'année 1938.** [The development of the Beetroot in Belgium during the year 1938.]—*Publ. Inst. belge Amélior Better.*, vii, 4, pp. 293–317, 1939. [Dutch, German, and English summaries.]

The following items of phytopathological interest occur in this report

[cf. *R.A.M.*, xviii, p. 78]. The loss in the Belgian sugar beet crop from virus yellows [see preceding abstracts] is estimated at fr. 46,422,700 as against fr. 30,031,000 in 1936, while the addition to the former sum of the fodder beet failures from the same cause would bring it to a total of over fr. 60,000,000.

Heavy damage was also caused by *Rhizoctonia violacea* [*Helicobasidium purpureum*: ibid., xviii, p. 76], the first effect of which is to lower the sugar content of the roots and ultimately to reduce their weight.

Mildew (? *Microsphaera betae*) [ibid., xiv, p. 548] was observed in the conidial stage on sugar beets at Alveringhem, this being the first record of the disease for Belgium. The conidia measured 35 to 45 by 12·5 to 18·7 (average 40 by 14·4) μ.

LEWIS (A. H.). **Manganese deficiencies in crops. I. Spraying Pea crops with solutions of manganese salts to eliminate marsh spot.**—*Emp. J. exp. Agric.*, vii, 26, pp. 150–154, 1939.

A tabulated account is given of experiments at three centres in the Romney Marsh (Kent) area in the control of marsh spot of peas [*R.A.M.*, xviii, p. 777] by the soluble manganous chloride, applied either to the soil at rates of 10 to 500 lb. per acre, or as a spray at rates of 5 to 20 lb. per acre, the spray being supplemented by 0·1 per cent. by weight of a wetting agent, lissapol L. Heavy dressings applied to the soil at sowing time had very little effect on the disease, but applications made when the plants were in flower were more effective. The best results, however, were obtained by spraying the plants at flowering with 5 to 10 lb. of the compound per acre, which at the latter rate reduced the incidence of the disease from 65·3 and 47·5 to 4·5 and 6 per cent. at two of the centres. On the basis of these results the author tentatively recommends spraying once at flowering with 24 lb. anhydrous manganous sulphate (or 36 lb. hydrated) in 100 gals. water plus 1 lb. lissapol L, or spraying twice at flowering with the amount of sulphate reduced to 12 (or 18) lb. Some evidence of increased yield from the manganese treatments (irrespective of the date of application) was obtained, but this aspect of the problem demands further study.

WALLACE (G. B.). **French Bean diseases and Bean fly in East Africa.**—*E. Afr. agric. J.*, v, 3, pp. 170–175, 1939.

During the past year, French beans (*Phaseolus vulgaris*) in the Tanga and Northern Provinces of Tanganyika Territory have made poor growth and given reduced yields as a result of attack by a number of diseases, including halo blight (*Phytomonas* [*Bacterium*] *medicaginis* var. *phaseolicola*) [*R.A.M.*, xviii, p. 495], rust (*Uromyces appendiculatus*) [ibid., xix, p. 59], common mosaic [ibid., xviii, p. 648], anthracnose (*Colletotrichum lindemuthianum*) [ibid., xvii, p. 716], and yeast spot (*Nematospora coryli*) [cf. ibid., xi, p. 698].

In a dry year, such as 1938, only the leaves, and to a less extent the seeds, of French bean plants show recognizable symptoms of halo blight. In 1938, the commonest leaf symptom consisted in large, dry, brittle, brown areas at the tip or near the margins, and bordered by a wide, pale yellow zone. Many leaves presented small, pale areas

bounded by darker green parts lying along the veins, this symptom somewhat resembling mosaic. Affected seeds show raised yellow or orange blisters, and when badly diseased may be small and completely coloured and blistered.

Pending the development of resistant varieties the following control measures are recommended in localities where susceptible crops are grown and the disease is endemic. Seed should be obtained from a healthy crop and sown in ground in which no susceptible species has been grown for at least three years; it should not be previously soaked. If seed is to be taken from the planter's own crop, seed should be sown singly and at wide intervals on a small plot away from the main crop, and affected plants rogued out, only the healthy seed being retained. When infection is severe, fallen leaves and old vines should be promptly burnt. If these methods fail, a resistant legume should be grown, such as soy-bean, adzuki bean [*Phaseolus angularis*], bonavist bean, broad bean, gram [*Cicer arietinum*], cowpea, or field peas; kudzu vine [*Pueraria thunbergiana*], white sweet clover [*Melilotus alba*], and lucerne are also resistant.

Rust is widespread in Tanganyika, where it is probably the bean disease best known to planters; anthracnose is not severe locally. Yeast spot is widespread, but varies in intensity.

Chorin (M.). **The chocolate spot disease of Beans.**—*Palest. J. Bot.*, R Ser., ii, 2, pp. 291–293, 1 fig., 1939.

The chocolate spot disease (*Botrytis fabae*) was observed on broad beans [*R.A.M.*, xvii, pp. 646, 767] in Palestine at the end of 1938. Previous occurrences of the fungus in the country in 1925–6 and 1935–6 were not accurately diagnosed. The spores of the Palestine strain measured 17·5 to 28 by 9 to 14 μ and thus slightly exceeded in length those of the Spanish [ibid., ix, p. 424] and Cyprus [ibid., xiv, p. 734] specimens; a comparative study of the various strains concerned in the etiology of the disease would be necessary to establish the exact identity of each. Ecologically the fungus is regarded as oceanic in character and thrives only where temperatures are [comparatively] low (the optimum for infection according to Wilson [ibid., xvi, p. 723] being 20° C.) and atmospheric humidities are high.

Van Poeteren (N.). **Onderzoek over het koprot in de Uien van de oogst 1938.** [An investigation on neck rot in Onions of the 1938 harvest.] —*Versl. PlZiekt. Dienst Wageningen* 90, 2 pl., 1939.

Of 99 pure cultures from 48 onions affected by neck rot, which was responsible for losses of 30 to 50 per cent. or more in the 1938 harvest in several parts of Holland, 69 yielded *Botrytis allii*, and two each *B. byssoidea* and *B. cinerea*, the first-named also developing in 16 cultures from 11 onions with soil rot, characterized by symptoms resembling those of neck rot but originating in the scales. *B. squamosa* was subsequently isolated from the dead leaves of potted onion plants, but its causal connexion, if any, with the decay could not be determined [*R.A.M.*, vi, p. 267; xviii, pp. 430. 431, 726]. Outstanding American contributions to the study of neck rot are summarized.

From an analysis of the meteorological data for the three years in

which the disease has been recorded in a serious form in Holland, viz., 1928, 1929, and 1938, the writer concludes that *B. allii* is favoured by relatively dry conditions. The Dutch mean summer temperatures (16·5°, 18·3°, 17·8°, and 15° C. for June, July, August, and September, respectively), fall within the limits of 15° to 20° defined in the United States as the optimum for the development of the fungus. From the replies to a questionnaire obtained from 26 growers owning 39 fields the following tentative conclusions are drawn. The disease would appear to occur indiscriminately on light and heavy soils, its incidence not being appreciably modified either by the choice of fertilizer or by the foregoing crop in the rotational sequence. Generally speaking, late (April), sowings tended to produce more diseased plants than earlier ones, and there were distinct indications of a correlation between rank growth and liability to infection.

Schultz (H.). **Blattschäden an Spinat durch Colletotrichum spinaciae Ell. et Halst.** [Damage to Spinach leaves from *Colletotrichum spinaciae* Ell. & Halst.]—*Zbl. Bakt.*, Abt. 2, ci, 9–13, pp. 225–232, 7 figs., 1939.

In the course of investigations at the Grossbeeren (Kreis Teltow) branch of the Biological Institute, on the reaction of vegetables to diseases, observations were made on the infection of El De Es spinach by *Colletotrichum spinaciae* [*R.A.M.*, xviii, p. 572], apparently not previously reported from Germany. The examination of diseased foliage revealed complete disorganization of the tissues, which were densely permeated by the inter- and intracellular hyphae. Above and below the lesions is formed the depressed, later erumpent acervulus, sparsely encircled by thick-walled, brown, mostly pluriseptate setae, 54 to 117 (average 80·6) μ, and giving rise to hyaline, cylindrical, closely aggregated conidiophores from which are abstricted oblong, unicellular, slightly falcate conidia of very variable dimensions, those from naturally infected leaves ranging from 20·7 to 27·6 by 3·6 to 5·4 μ, from the moist chamber 23·4 to 39·6 by 2·7 to 4·5 μ, and in culture from 13·5 to 29·9 by 2·4 to 5·2 μ. On the basis of these data, Ellis and Halsted's diagnosis of *C. spinaciae* is emended in respect of conidial dimensions to 13 to 30 by 2·5 to 4·5 μ, and of those of the setae to those given above. Chlamydospores were produced in pure culture by some of the mycelial cells developing a thick membrane.

In the field the leaf blight spread from El De Es to all the other varieties under cultivation, namely, Berlin Markthallen, Brunswick Giant, Juliana, King of Denmark, Matador, Scharfsamiger, Universal, and Victoria. Inoculation experiments in the greenhouse with a conidial suspension of the fungus resulted in heavy damage, mostly followed by death, on the El De Es, Gaudry, King of Denmark, Long-leaved Winter, Matador, and Improved Green Thick-leaved varieties. Friedrichswerth beets reacted similarly to spinach, but the symptoms were milder and the fructification of the pathogen less intense, while Erstling [Duke of York] potatoes were so slightly attacked that there is considered to be no risk of infection under natural outdoor conditions.

The fungus is perpetuated by means of the seed, Dutch El De Es samples of which were covered with acervuli and gave rise in sterile

soil under a bell-jar to severely infected plants. In the field dissemination is effected by the conidia which are formed in profusion.

FIKRY (A.). **Water-table effects. IV. Relative incidence of diseases on Cucurbits.**—*Bull. Minist. Agric. Egypt* 221, 9 pp., 13 pl., 6 graphs, 1939.

In further studies on the effect of varying heights of the subsoil water table on the incidence of crop diseases [*R.A.M.*, xvi, p. 755], the author conducted field experiments at Delta Barrage, Egypt, in 1935 and 1937 with Iskandarani vegetable marrow and Chilian Black Seeded watermelon, naturally infected with mildew (*Erysiphe cichoracearum*) [ibid., xiii, p. 216] and leaf spot (*Colletotrichum lagenarium*) [ibid., xvii, p. 789], respectively. The experimental plots were situated on three terraces, the low one about 35 cm. lower than the medium and the medium about 65 cm. lower than the high. The average height of the subsoil water table from August to October, 1937, was from 10 to 85 cm. in the low and from 105 to 185 cm. in the high terrace. The results show that both diseases appeared earlier, developed more rapidly, and were more severe in low plots than in high ones, the plants being consequently less vigorous and the yields poorer in the former. Thus, of the vegetable marrow plants 100, 80, and 65 per cent. were diseased in the low, medium, and high plots, respectively, the corresponding figures for watermelons being 100, 64, and 21 per cent., respectively, and while a high percentage of plants were killed by the diseases in the low terrace, none perished in the higher ones. During the period of maximum water-table height in September and October, the crop obtained from the high terrace of two plots was, respectively, 8 and 17 times greater in the number of fruits and 13 and 20 times greater in weight than in the low one.

The physiological wilting of watermelon plants sown by the Baili method (comprising the setting of germinated seeds in soil wetted by high subsoil water in January and February) observed in various districts, was proved in experiments at Salhia to be directly caused by high water-table level. Secondary organisms, mainly a species of *Fusarium*, invade the rotted roots of the wilted plants after a time.

DOOLITTLE (S. P.), BEECHER (F. S.), & PORTE (W. S.). **A hybrid Cucumber resistant to bacterial wilt.**—*Phytopathology*, xxix, 11, pp. 996–998, 1 fig., 1939.

Promising results have been obtained at the Beltsville (Maryland) Horticultural Station in the development of a cucumber resistant to wilt (*B*[*acillus*] *tracheiphilus*) [*Erwinia tracheiphila*: *R.A.M.*, xix, p. 65] by crossing Tokio Long Green with Vickery Forcing, the offspring of which (both entirely selfed and partially open-pollinated) contracted only 18 to 32 per cent. infection in 1938 compared with 74 per cent. in White Spine and 100 in certain foreign varieties.

BOTTOMLEY (A[VERIL] M.). **Intensive Mushroom-growing for the amateur. III. Pests and diseases.**—*Fmg S. Afr.*, xiv, 164, pp. 443–447, 6 figs., 1939.

The author states that, so far as is known, the only fungal diseases

of importance that affect cultivated mushrooms [*Psalliota* spp.] in South Africa are that due to *Verticillium* sp., and white plaster mould (*Monilia* [*Oospora*] *fimicola*) [*R.A.M.*, xviii, p. 88]. The former is favoured by humidities over 95 per cent., temperatures over 65° F., poor ventilation, and the presence of trash on the beds and floor. Control measures consist in regulating humidity, temperature, and ventilation, immediately destroying infected mushrooms, and spraying the affected parts of the beds after the removal of the affected mushrooms with Bordeaux mixture (2–2–50). As a last resort, the casing soil can be removed and the beds recased. To remove the disease from a house all the woodwork should be gone over with a blow-lamp after harvesting, and the premises disinfected with 2 per cent. formalin [cf. ibid., xix, p. 63]; prevention depends on maintaining the peak heat of the compost at 130° for 12 hours.

The principal causes leading to attack by *O. fimicola* are improperly fermented manure and chilling of the beds; contributing factors are excessive moisture and inadequate ventilation. The only control method known is to remove the affected casing soil or compost and that round it. Under South African conditions, growers might replace it with sterilized soil moistened with dilute acetic acid, or sterilize the edges of the remaining compost and casing with 2 per cent. formalin. To prevent further attacks the shelves should also be sterilized with formalin and flamed with a blow-lamp after each crop.

The paper concludes with a list of recommendations on the care and upkeep of mushroom beds.

Watanabe (T.). **Studies on the physiologic specialization in Fusarium sp. causing the stem rot of Sweet Potatoes. III. Toxicity of the cultural filtrate. IV. Pathogenicity. V. Morphology and taxonomy of the causal fungus. VI. Conclusion.**—*Bull. Utsunomiya agric. Coll.*, Sect. A., ii, 7, pp. 263–321, 1939. [Japanese, with English summary.]

Forty strains of the species of *Fusarium* responsible for stem rot of sweet potatoes in Japan [*R.A.M.*, xviii, p. 496] were grown for a month at room temperature on a quintuple Richards's solution and observed for cultural and pathogenic evidence of physiologic specialization. Tests of the toxic effect of the cultural filtrates on stem cuttings of the host resulted in the tentative classification of the strains under review in three growth types.

In inoculation tests on seedlings of 13 varieties the lowest percentages of infection (20 to 25 per cent.) were obtained with strains 7, 11, 31, and 4, and the highest (45 to 50) with 2, 30. 32, 14, and 24, the remainder producing intermediate effects. The most resistant variety was Taihaku, with 13·8 per cent. infection, followed by Kintoki and Oiran, and the most susceptible Jiugonichi (59·3), with Kawagoe-Beniaka and Akaimo next in order. The length of the fissures induced by the various strains on the host stems was closely correlated with the incidence of infection. The strains under observation fell into six types on the basis of their pathogenicity relationships.

Taxonomic studies of the isolates on 2 per cent. potato dextrose agar at 30° C. revealed only slight differences in the length and breadth of

the microconidia and the width of the macroconidia, but the length of the latter varied appreciably. On the basis of this character, therefore, the strains are classified as follows: 14 (including Nos. 14, 24, and 32) are referred to *F. bulbigenum* var. *batatas*; 25 (including Nos. 4, 7, 11, 30, and 31) to *F. oxysporum* f. 2; and one (strain 2, the most highly pathogenic of all) to *F. semitectum* var. *majus* [ibid., xvii, pp. 154, 161, *et passim*].

LIHNELL (D.). **Några iakttagelser rörande sjukdomar på Soja i vårt land.** [Some observations concerning Soy-Bean diseases in our country.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh.*, *1939*, 4–5, pp. 69–73, 5 figs., 1939.

Soy-beans, a new experimental crop in Sweden, are subject to the following diseases: bacteriosis (*Pseudomonas* [*Bacterium*] *sojae*) [*R.A.M.*, xvi, p. 585], *Peronospora* [? *manschurica*: ibid., xv, pp. 198, 632], *Sclerotinia sclerotiorum* [ibid., xi, p. 87, 316], and various forms of mosaic [ibid., xviii, p. 608], including that referred to in the literature as 'soy-bean virus 1'.

KOVAČEVSKI (I. C.). **Die Blattfleckenkrankheit der Paprika in Franz. Marocco.** [The Chilli leaf spot disease in French Morocco.]—*Z. PflKrankh.*, xlix, 10–11, p. 567, 1939.

The chilli leaf spot disease attributed by G. Berger in French Morocco to *Cercospora capsici* Heald & Wolf [*R.A.M.*, xvii, p. 507,] is considered from the accompanying figure to be undoubtedly due to *Cladosporium capsici* (March. & Stey.) Kovač., fully described from Bulgaria [ibid., xvii, p. 791]. Other countries in which the fungus occurs include Spain, the Belgian Congo, and the Azores.

The Plants Protection Ordinance (Kenya), 1937. Government Notices Nos. 851 (1938) and 468 (1939).—2 pp., 1939. [Mimeographed.]

Government Notice No. 851 of 21st November, 1938, adds barberry and buckthorn [*Rhamnus* (?) *cathartica*] to the list of seeds the importation of which into Kenya is allowed by Government Notice No. 688 of 2nd September, 1937, only under permit [*R.A.M.*, xvii, p. 208], while potatoes are added to the schedule by Government Notice No. 468 of 19th June, 1939.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. List of intercepted plant pests, 1938.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 62 pp., 1939.

Lists are given of pests and diseases intercepted on plants or plant products entering the United States during the period 1st July, 1937, to 30th June, 1938 [cf. *R.A.M.*, xvi, p. 784]. Attention is drawn to the serious quarantine problem presented by the destructive virus diseases, which cannot be detected in most types of material submitted to inspection, and in any case could not be specifically determined: a case in point is the heavy damage reported as due to viruses on imported lily bulbs [ibid., x, p. 461].